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Will History Repeat Itself?

APROPOS of the deliberations of the present Congress on the subject of merchant marine legislation, we reprint herewith part of an editorial from the May, 1898, issue of *Marine Engineering.*

"It would be interesting to know the present opinion of those members of Congress who in the past have blocked the way of naval progress, supposing, of course, they have acted from conviction. To prepare ourselves for war with a fifth-rate naval power we have been compelled to scour the shipyards of Europe for naval vessels, and to be content, at that, with a few comparatively insignificant ships. Of these, two, at least, will not be of the slightest practical value during the period of hostilities, as the *Abrouill* and *Somers* will not be allowed to sail from the English ports where they are now lying. The previous apathy of Congress has also forced the Navy Department to the necessity of purchasing, and placing in commission, numerous small vessels, for offensive purposes, which were never intended in design or construction for such use. Should any serious loss of life result from the employment of these necessarily inefficient vessels the responsibility will rest entirely with these members of the House and Senate. With talk of "entangling alliances" on the one hand and pretended economy on the other, they have declined to vote the money necessary for the construction and proper equipment of a navy commensurate with the importance of the foreign interests of the United States. It has thus come about that many unthinking persons blame the officials of the Navy for our unreadiness, when there is no ground whatever for a word of censure here. In the various departments of the Navy there are today as thoroughly informed and capable men as can be found in any navy in the world. Without appropriations, their knowledge and ideas cannot be productive of results. There is no profit in worrying about the past, however, if it is an example that is profited by. In the passage of the naval appropriation bill, with additions by the Senate, as recounted elsewhere, there are signs of faint appreciation of the present requirements. No advance has yet been made with the proposition to speedily construct a number of torpedo boats, a measure which has the hearty support of Chief Constructor Philip Hichborn and Engineer-in-Chief George W. Melville. Had the bill been pushed through Congress, work would even now be pretty far forward on the boats, and the contracts would have the splendid effect of raising the standard of workmanship in many of the yards which would likely get orders."

Will history repeat itself; and will it be "from conviction"—or political bartering?

A Time for Action

IF American shipowners are to receive the aid which they so urgently need for operating vessels in foreign trade, their requirements must be clearly presented before the House Committee of Merchant Marine and Fisheries which is now holding hearings on the shipping measures introduced in the House. The sentiment of the country is overwhelmingly in favor of legislation that will enable private owners and operators to meet foreign competition in this trade.

In the shipping bills now under consideration, various provisions will be found that, combined in workable form, will accomplish the desired result, and it is up to the shipowners and others vitally interested in the issue to make sure that their position and needs are fully understood.

The Mount Vernon and Monticello

AFTER numerous surveys, voluminous reports and much useless and largely unintelligent discussion, the final fate of the two great German built liners, now known as the *Mount Vernon* and the *Monticello,* seems in a fair way of being settled. Before another year is passed the scrap heap will likely have claimed them or they will be well on their way to rebirth with the prospect of a considerable period of further useful life ahead of them.

In the generality of cases, the investment of large

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sums of money in the rejuvenation of twenty-year old ships is, to say the least, an extremely doubtful policy. No matter what changes and alternatives are made or what replacement and modernization of equipment and outfit may be carried out, the unavoidable fact of age remains and this, coupled with the more or less generally accepted idea that the normal life of a steel vessel is limited to 20 years, usually acts as an effectual preventive when the extensive rebuilding and overhauling of old vessels, particularly of the passenger carrying class, is proposed.

On the other hand the condemning of a vessel as incapable of future useful service and unworthy of considerable expense to fit her for that service, merely for the reason that she happens to have reached a purely theoretical and arbitrary limit of useful age is certainly unwarranted and may prove to be the height of wastefulness. The depreciation of a ship and her probable period of future usefulness is almost entirely an individual and very specific matter. With vessels of the class here considered, when they have been originally well built, of the best materials, and thereafter maintained in good physical condition, the limit of useful life is in reality little affected by actual, physical wearing out but is mainly determined by continued ability to render what is considered, or rather what has come to be considered, with the passing of years, as first class service. Physical depreciation in a well built and properly maintained vessel is a relatively slow process; there is an abundance of evidence to show that an iron hulled vessel may easily continue in active service for 50 years and that with steel a useful life of 35 or 40 years may not unreasonably be expected. So far as the hull is concerned a first class steel ship, 20 years of age which has been well cared for should be capable of rendering many years of useful service.

So far as the *Mount Vernon* and *Monticello* are concerned it may be readily admitted that were they in the possession of one of the large privately owned foreign lines, in their present dismantled condition, they would not be reconditioned for the simple reason that such lines have steadily kept abreast of the times and met the increasing demand of the traveling public by the building of new vessels. The United States Lines, on the other hand, notwithstanding the increasing popularity of their services, has built no new ships and has none in immediate contemplation. Long before new ships could be completed, even if started at present, these lines will be seriously crippled because of lack of tonnage; their present inadequate and ill balanced fleet cannot go on indefinitely.

Whatever may be the ultimate fate of the Jones bill, it seems altogether probable that the government will continue to operate the United States Lines for some time to come, and, in view of this fact, the Shipping Board is quite justified in its proposal to recondition the two ex-German liners. Their hulls are in excellent condition and it is doubtful if their models could be very greatly improved upon although present practice would demand somewhat greater breadth of beam than was the rule 20 years ago. While the entire rearrangement and rebuilding of passenger quarters and the installation of modern propelling machinery does involve the expenditure of a very large amount of money the latter is far less than the cost of building new vessels and the work can be completed in a much shorter time.

If the United States Lines are to continue in business they *must* have additional tonnage at the earliest possible moment and the reconditioning of the two ships in question appears to offer an entirely practicable method of meeting this situation. In view of the very serious situation with which these lines are even now confronted, no possible solution should be condemned off hand without mature consideration and the reconditioning of the *Mount Vernon* and *Monticello* certainly offers far more than a *possible* way of providing additional tonnage.

The Lexington

BUT little more than a superficial study of modern civilization is needed to make clear the fact that on its more material side it is a development, in one form or another, of engineering. Transportation, communication, manufacturing, construction of every sort, even the personal and intimate problem of living—surrounded and shaped as it now is by devices and conveniences undreamed of but a few years ago— are mainly examples of applied science, of the successful application of engineering skill, and the imagination, daring, and persistence of engineers.

Covering virtually the whole sum of human existence in its practical and material aspect, the range of present day engineering accomplishment is too vast to be grasped by any one mind, and yet there is one of its products in which all, or nearly all, of its widely spread factors are totaled in one tremendous sum—the modern warship!

Recently the writer was privileged to visit the U. S. S. *Lexington*. Accompanied by one of her officers, he saw, perhaps, a tenth part of the *surface* of things on this enormous and wonderful vessel. Physically, it was a two-hour ordeal of ladder climbing, and dodging men and things. Mentally, it was an introduction to a maze in which old and familiar objects assumed new and strange shapes, and new ones, appearing on every hand, baffled the imagination and left the mind with comprehension crowded out by wonder—wonder that such an assemblage of machinery and structure could be created; more wonder that it could, by mere man, be made to work.

Not only does the *Lexington* apparently comprise in her structure and equipment all of the component parts which have been gradually included in the sum total of the modern capital ship; but her special mission has added to this sum new and hitherto untried

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factors, and has created novel problems in the design of hull and machinery, the successful solution of which offers a most convincing demonstration of the skill, resourcefulness and, perhaps it is not too much to say, the daring of her designers and builders.

While it is to meet the requirements of the as yet little known and unfamiliar plane carrier, that many—if not most—of the novel and unusual characteristics of the *Lexington's* design and equipment have been developed, one may not unreasonably indulge in some speculation as to the possible extent of their adoption in other and more familiar types of ships—even in those devoted to the peaceful pursuits of commerce.

Certain it is that the hull structure alone might well cause a classification society to gasp, so wide are the apparent departures which have been made from established and "orthodox" practice. Who would have had the audacity of proposing, even a few years ago, the cutting away of a large section of the shell plate girder—almost at its upper edge—in an 800-foot seagoing ship; or of contemplating, almost in the very center of the ship, an open hull (there seems to be no other fitting name for it) hundreds of feet in length, three-quarters of the beam in breadth, and some 20 or 30 feet in height, with not a single staunchion or pillar from end to end? Yet here all this and even more has been done, and the ship still floats and has her being, and there is every likelihood that she will continue to do so!

It is not suggested or even imagined that the features mentioned will ever find their exact counterpart in a commercial vessel, but their existence does show most conclusively that successful hull construction need not always be confined entirely to the set rules of precedent and previous experience, and that there is a wide field for the exercise of resourceful and creative genius in the design of the hull structure of large vessels.

In another and quite different way the *Lexington* is most unusual—probably unique. Of her, it can undoubtedly be said with more truth than of any of her predecessors, that she is unsinkable. Certainly no imaginable collision could sink her, and it seems doubtful that even repeated torpedo attacks could accomplish this result. The "unsinkable" ship may readily be admitted within the realm of possibility, but its practicability has, for the best of reasons, been denied. Yet here is a workable ship, with her propelling machinery in over 20 entirely separate compartments, accessible only from the deck above, and with her fuel carried in over 400 compartments, to indicate but a part of the extent to which subdivision has been carried.

Previous experience has confirmed the belief that subdivision to the point of practical unsinkability was unworkable, but the *Lexington* and her sister *Saratoga* seem to point the way to new things in this department of naval architecture; the answer to the problem can, in their case, be expressed in one word—electricity. The electric drive makes possible the perfect control of motors and generators from one central station, regardless of their distance and relative insulation. Electric means of communication brings the control of the boilers, each in its separate compartment, directly to this same station; and electric indicators furnish a constant visual report of just what is going on in each of the 24 machinery compartments, and so on throughout the vessel. Personal contact and direct verbal order have given place to electrical device; without which such ships, or at any rate the successful operation of such ships, would be impossible.

Again, we are far from implying that such complication of mechanical and electrical device is practicable or can ever be necessary on a commercial vessel; but it is nevertheless true that many of the ends sought in the design of these great vessels are, only in less degree, sought in the design of every great passenger liner. Of their military value, only the expert is competent to judge; as examples of radical change from things that have been to things that may be in the world of naval architecture, they stand in a class by themselves pointing the way, or at least *a* way, to the "ship of the future."

Stress and Strain

FOR the naval architect perhaps the most outstanding example of the "stress and strain" problem is to be found in the design of the superstructures of large vessels and the effective distribution of the material entering into their construction. So long as ships were of comparatively small size and virtually all of flush deck type, with only detached and relatively small houses or erections above the upper continuous deck, the question of the structure of these erections, as related to that of the vessel as a whole, did not arise, as such stresses as they were called upon to withstand were purely local in character. With increase in dimensions and the adoption of more or less continuous erections, of two or more decks in height above the main hull, the unavoidable bending of the latter, due to variations of loading or of displacement distribution in a seaway, very quickly gave evidence of its existence in the breaking of stringers and side plating and similar indication of overloading in the upper portions of the superstructure, and in the neighborhood of casings, hatchways and similar localities where an abrupt change of longitudinal structural material existed.

The need of special care in the design of continuous deck erections was disclosed at about the same period in two quite different classes of ships. In the large Atlantic liners a distinct change in general design and arrangement came into evidence from 1880 to 1890. The older type of narrow hull with its accompanying necessity of small top weights gave place to a much larger ratio of beam to depth, the added stability so obtained

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being devoted to the support of continuous tiers of heavy houses and casings although the structural arrangement and scantlings of the latter did not materially differ from those of the smaller erections which had preceded them. No attempt was made to incorporate these erections into the general stress resisting structure and in consequence they were quite unable to withstand the loads which their great distance from the neutral axis of the longitudinal hull material inevitably brought upon them. Obviously, two courses were open to meet this situation. One was to so strengthen the superstructure as to enable it successfully to carry the loads brought upon it—in other words, to make it an integral part of the general hull structure. The other was to so arrange it that it could freely conform to the bending of the hull, leaving the latter free to carry all its load. To bring this about, the "continuous" superstructure had to be divided, transversely, into two or more portions, free to move independently of each other, water and weather tightness being maintained by slip or "expansion" joints at the points of division. This method of dealing with strains in upper works has been practically universal until comparatively recently. It has the disadvantage of localizing the "working" of the superstructure in the neighborhood of the expansion joints, making these places undesirable for passenger accommodation on account of the creaking and groaning in the joiner work which is practically certain to be set up with the ship in a seaway.

The other class of ship in which stress and strain in the upper works pushed itself into prominence was the large transatlantic cattle steamer, or rather the combination passenger and cattle steamer which many of our readers will doubtless remember as attaining such great popularity with the traveling public during the early years of the present century. As the carrying of cattle at sea increased in volume the early, temporary wooden fittings, carried on the ordinary well decked or "three island" cargo steamer soon gave way to the shade decker, a full scantling steamer with what appeared to be a continuous superstructure and deck, above the upper or strength deck of the hull. In reality this superstructure, or shade deck, consisted of a series of erections, or permanent shelters, separated by hatchways extending entirely across the ship with doors in the side plating, the deck openings being covered by wooden hatch covers, sometimes fitted in large sections. So long as erections on the shade deck were small, as required for crew accommodation only, this proved to be a satisfactory type of ship, but with the demand for passenger quarters more extended houses and a heavier superstructure deck became necessary. This led to the development of the shelter deck, with bridge erections and houses above the upper continuous deck for housing the passengerss.

The first vessels of this type were little more than shade deckers with the gaps filled in, forming a continuous steel superstructure or shelter deck. While scantlings were increased somewhat to carry the added bridge erections and houses, the upper deck continued to be the upper strength member of the hull. As length of ship and relative length of shelter deck erections were increased to meet the demand for greater passenger accommodation it was found that the latter showed signs of severe straining, particularly near the ends where side plating frequently cracked and it was almost impossible to prevent serious leakage in the neighborhood of the bulkheads at the bridge house ends. The deck houses above also gave some trouble.

The obvious remedy was to make the shelter deck the upper strength member but owing, apparently, to a belief that the presence of large cattle ports between the upper and shelter decks would prevent a proper transmission of the longitudinal shearing stresses to the shelter deck plating, this distribution of material was not resorted to for some time. So far as the writer is aware, the first large ships of this type in which the shelter deck was made the strength deck, were the *Mongolia* and *Manchuria,* built at Camden, N. J., in 1903. These vessels were originally ordered by the Atlantic Transport Company and except in the location of the strength deck were practically duplicates of that company's *Minnehaha* and *Minneapolis.* When finally completed, for the Pacific-Mail, the shelter deck erections were much longer than originally contemplated but not the slightest structural weakness in the upper works has ever developed.

At best, the expansion joint is somewhat of a makeshift. There are, no doubt, certain cases in which its use cannot well be avoided, but in recent years a very distinct tendency has become apparent, even in passenger steamers with extensive superstructures, to so design and strengthen the latter as to enable them to carry their share of general structural stress, without undue straining and fatigue. In the way of continuous side plating this is a comparatively easy matter, bridge erections being incorporated into the hull structure in much the same way that the strengthening of the shelter deck cattle steamer was accomplished. With erections not extending to the ship's side the problem is more complicated. The transmission of shear through deck plating and casings may produce distortion as well as direct strain and efficient transverse bracing in the form of carefully distributed bulkheads and web frames must be resorted to.

In the foregoing the structural side alone has been considered. It must be remembered that this is but one of the factors in the general design problem. Tonnage, freeboard regulations and similar requirements all have to be met and these often interfere with the most economical structural arrangment. The final working out of the ultimate and perfected ship for any given service is usually an involved and complicated development, often extending over many years, but it is interesting to note and, incidentally, must be a matter of satisfaction to the naval architect that, in almost every case, the final result is one in which the dictates of sound engineering common sense are upheld.

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Shipping Bills Before the House

Provisions of the White bill—Shipping Board recommendations — Pacific Coast Lines sold

By Harold F. Lane

WASHINGTON, D. C.

ACTIVE consideration of merchant marine legislation on the House side of the Capitol was scheduled to begin on February 27 at a hearing before the committee of merchant marine and fisheries on the Jones bill, which was passed by the Senate on January 31, the bill introduced by Representative Wood, of Indiana, and a new bill introduced by Representative White, of Maine, H. R. 10,756, which he hopes will bring about the creation, development and maintenance of an American merchant marine having both cargo vessels and passenger-mail carriers, owned and operated by private citizens.

This means that possibly little more will be heard of the Jones bill, which the President has indicated he does not favor, although Senator Jones has stated that he has heard rumors that the bill would be stifled in committee and that if so he would offer it as a rider to the tax reduction bill when that comes up in the Senate. Such action in the House committee, he said, "will demonstrate the inability to get government aid through Congress and fully justify the Senate's course." However, he added, "if the bill comes back to the Senate with an adequate ocean mail pay provision, with the loan provisions of the act of 1920 reasonably modified, and with certain provisions of the Wood bill and other bills now pending, such amendments will, in my judgment, have most sympathetic consideration and an adequate measure be passed . . . . . If it can be done, let the bill be amended so that government construction or ownership will not be needed. I will rejoice if this is done. There must, however, be no uncertainty about such a proposal, and there need be none. We must be sure that ships will be built under any new proposition."

Provisions of the White Bill

In a statement explaining his proposal, Mr. White set forth that it "proceeds upon the assumption that the American people prefer private operation of ships and that they are willing to pay reasonable amounts to effect the transfer of existing governmental lines to private hands and to insure successful operation of these and new vessels by private operators."

The White bill would provide all the assistance from the government requested by the Transoceanic Corporation in its proposal which was described at a hearing before the Shipping Board on January 24 for the institution of a high-speed passenger and mail service between the United States north Atlantic coast and French and British ports. This proposal received scant consideration during the debate in the Senate on the Jones bill, but it has since been outlined to President Coolidge on February 11 by Lawrence Wilder, and the President let it be known that he was interested in its possibilities.

The White bill provides for more liberal terms for loans from the Shipping Board's construction loan fund, including the lending of up to three-fourths of the cost of a vessel at interest as low as 2½ percent. It also would provide for financial aid to owners of carge services under contracts to be entered into by the Shipping Board with those who own, or give assurance to the board that they will own when the aid contract becomes effective, vessels under the American flag to operate in services specified by the board as essential to American commerce; contracts for carriage of ocean mails on American vessels at liberal rates; establishment of a merchant marine naval reserve; provision for reinsurance in a fund to be set up by the Shipping Board. Under its terms the board, in the event it fails to establish the essential routes under private ownership by means of the aid contracts, shall continue operations with its own vessels on such routes.

The plan of the bill is for the board to designate the essential services, probably the services it now maintains, and then invite bids for the operation of such services by Americans who own or will own vessels at a figure at which they believe they can pay the losses. The government then would make up to the operators the losses, not exceeding the average loss sustained by the board over a three-year period. Representative White hopes that competition among bidders will result in furnishing the services for less than the cost to the board.

The Senate on January 27, during the debate on the Jones bill, adopted a resolution offered by senator Bingham, of Connecticut, and modified at the request of Senator Walsh, of Massachusetts, directing the Shipping Board to investigate and report on the proposal of the Transoceanic Corporation to build fast passenger ships with government aid. The amendment proposed by Senator Walsh, would include an inquiry into the company's financial standing, its plans for future financing, etc., and the recommendations of the board.

President Coolidge does not favor the Jones bill, particularly the provision adopted by the Senate requiring unanimous consent of the members of the Shipping Board before a ship can be sold. He was represented as holding the opinion that this would make one member of the board the equivalent of a majority because one of the commissioners has an almost perfect record of voting against the sale of ships, and that if the bill should become a law, in order for the Shipping Board to function, it would be necessary to have a radical change in its personnel. The President believes that perhaps the country could stagger along under the present board without the sale of ships.

Shipping Board Recommendations

Following a conference with representatives of shipping and shipbuilding interests held by the Shipping Board on January 10 and 11, the board on February 17 announced the adoption of a report, based in part on the recommendations of the conference, including a series of recommendations which, it is said, if carried out, will in its judgment give the country "within a reasonable time, a permanent and prosperous merchant marine." The board says that if it is the purpose to bring about the transfer of the government fleet to private ownership immediately, it will be necessary to provide some form of direct aid, but that it is assumed that for the present there is no prospect of Congress

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enacting subsidy legislation. On the other hand, if it is proposed to bring about the transfer gradually, the adoption of certain indirect aids would prove very effective, it says, and it then proceeds to outline a series of seven recommendations representing a combination of what the board considers the best features of several bills now pending in Congress. The text of the board's statement, omitting the recommendations of the conference, which were published in the February issue of *Marine Engineering and Shipping Age,* follows:

Pursuant to action of the Shipping Board on December 28, 1927, the chairman invited the leading steamship men of the United States to a conference on shipping matters, in order to bring about a clearer understanding of the position of the private steamship interests with respect to the various plans that have lately been suggested for upbuilding the American merchant marine.

The conference was held in Washington on January 10 and 11, 1928, and was attended by representatives of all branches of the shipping industry, as well as by members of Congress and others interested in the various problems discussed. It was said to be the largest gathering of the kind ever held in the nation's capital.

Without entering into details of the proceedings, the full report of which covers more than 140 pages, it will be enough to say that in the closing hours of the conference majority and minority resolutions were adopted (see pages 66 and 67 of Marine Engineering and Shipping Age for February, 1928).

The Shipping Board, charged with the duty of carrying out the national shipping policy, feels obligated to transmit these resolutions to Congress, and to accompany them with a brief statement of its views as to the principal points that should receive consideration in any future legislation affecting the American merchant marine. With but a few exceptions, the points stressed by the board will all be found in one or another of the bills referred to in the resolutions, namely, the Copeland bill (S.2036), the Jones bill (S.744), the Wood bill (H.R.2); and also the White bill (H.R.10765) which has since been introduced.

It seems unnecessary to state that the primary object of further legislation at this time is to provide conditions that will enable American ships engaged in foreign trade to compete on something like equal terms with the ships of other nations; and until, due to such legislation, the transfer of ships to private hands is accomplished, adequate means should be provided whereby to maintain efficiently the present number of essential steamship services. If these conditions are provided, it is obvious that no further difficulty should attend the ultimate transfer of the Government's steamship services to private American ownership for permanent operation, as contemplated in the Merchant Marine Act of 1920.

While the Shipping Board believes that each of the bills mentioned above contains provisions which if put into effect would prove of great benefit to the merchant marine, it is nevertheless apparent that no single one of them, considered by itself, provides all the legislation necessary to meet the present requirements and purposes laid down by the Merchant Marine Act. For this reason a combination of the best features of all the bills would seem to be advisable.

In furtherance of this thought, the board submits herewith several definite recommendations which, if carried out, will in its judgment give to the country, within a reasonable time, a permanent and prosperous merchant marine made up of fast modern ships under private ownership, capable of transporting the greater portion of our foreign commerce and of serving as a powerful naval auxiliary in time of national peril.

Based as most of these recommendations are on the sentiment developed during the recent conference of steamship men, they must be looked upon as carrying the endorsement not only of the Shipping Board, but of representatives of the country's private shipping interests as well. It is a matter of general satisfaction that never before in the nation's history has there been greater unanimity of opinion throughout the shipping industry as to what should be done to develop a merchant marine commensurate with the country's unrivalled commercial position and vast foreign trade.

In making recommendations to facilitate the transfer of the Government's war-built fleet to private ownership, under conditions assuring permanency of operation, two alternatives present themselves:

If it is the purpose of Congress to bring about the transfer immediately, then it will be necessary to provide some form of direct aid which will enable the private American purchaser of Shipping Board vessels to meet foreign competition and overcome the differentials now favoring the foreign ships due (1) to lower capital charges, (2) lower operating costs, and (3) to the foreigner's long years of entrenchment in the foreign trades. If this policy should be determined upon, the Shipping Board in cooperation with private American steamship owners, will furnish the necessary data on which to base estimates as to the direct aid required.

It is assumed that for the present there is no prospect of Congress enacting subsidy legislation.

If on the other hand Congress is content with carrying out the present Merchant Marine Act so as to bring about the transfer gradually, meanwhile providing for vessel replacements and new construction, the adoption of certain indirect aids would prove very effective, such as

1. A reaffirmation, as provided in the Jones bill (S.744), of the national policy to establish and maintain a permanent merchant marine.
2. Generous compensation for the carriage ot foreign mails under long term contracts.
3. A liberalization of the terms under which loans may be secured by the American shipbuilder and operator from the present construction loan fund.
4. Federal tax exemption on American vessels operating in foreign trade, including a provision whereby deductions shall be allowed from taxable incomes derived from operating profits, to the extent that such profits are devoted to new ship construction.
5. Transfer to privately-owned American vessels of the business now handled by Army and Navy transports and by the vessels owned and chartered by the Panama Railroad Steamship Line.
6. Amendment of Section 33 of the Act of Congress approved February 28, 1925, providing for the creation of a Naval Reserve, so as to authorize two months' pay to such officers and men of the Merchant Marine Naval Reserve as are employed on vessels of the American merchant marine engaged in foreign trade.
7. The establishment of an insurance system which will place American vessels on an equality with foreign vessels in the matter of insurance.

Pacific Coast Lines Sold

Sale of the three remaining government-owned cargo services on the Pacific Coast to three different business organizations was approved by the Shipping Board on February 16. Transfer of the vessels to their new owners will be commenced as soon as sales contracts are signed. Each vessel will be delivered upon its next arrival in port.

By this action the government goes entirely out of the shipping business on the Pacific Coast and that portion of the American merchant marine, which operates from that coast, comes under the ownership of private interests that guarantees to maintain regular services over prescribed routes for a period of five years. In addition to this guarantee the new owners agree to give six months notice in the event abandonment or curtailment of the liner services is contemplated by them.

The American Australia Orient Line, which operates a fleet of 21 ships out of San Francisco and Los Angeles to ports in Australia, New Zealand, Philippines, China and Japan, is sold to a corporation owned and operated by the Matson Navigation Company and the American Hawaiian Steamship Company. The price which they will pay for the vessels and the good will of the line is $1,981,755.50. The sum of $58,834.85, or 2½ percent of the total purchase price was paid when the bid was submitted. An additional 22½ percent of the purchase price of each ship will be paid on delivery of the vessels. The balance, or 75 percent of the total will be paid over a period of seven and one half years with interest on unpaid balances at the rate of 4¼ percent payable semi-annually. Payments to the board will be made annually.

Under its sales agreement the new owners of this line will maintain monthly sailings from San Francisco to Japan and North China ports; monthly sailings from these American ports to South China, both China routes including Shanghai; monthly sailings from Seattle, Ta-

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coma, San Francisco and Los Angeles to New Zealand ports; and monthly sailings from these four American ports to Australian ports. The service to other ports on both sides of the Pacific will also be provided when the performance of such service will not interfere with maintenance of the regular prescribed schedules.

The ships and good will of the Oregon Oriental Line, which operates a fleet of 11 ships from Portland, Oregon to Japan and China, are sold to a new corporation headed by K. D. Dawson of Portland, for the sum of $1,065,000.00. Mr. Dawson is vice president of the Columbia-Pacific Shipping Company, present operators of this line. Payment of the purchase price will be made on the same basis as that for the American Australia Orient Line, a certified check for $26,625.00, or 2½ percent of the total purchase price having accompanied the bid.

This line under its new ownership will maintain a schedule of monthly sailings from Portland to ports in Japan and North China and semi-monthly sailings from Portland to South China and the Philippine Islands. This line will also give service to other ports when cargo offerings warrant and no interference with maintaining the prescribed schedule will result.

The cargo ships and good will of the American Oriental Mail Line, which operates a fleet of seven ships out of Puget Sound ports to the Orient, are sold to a new corporation to be known as the Tacoma Oriental Steamship Company for $696,906.00. Payment of this sum will be made on the same basis as that for the other two lines, certified checks aggregating $17,422.65 having accompanied the bid. The line will maintain monthly sailings from Seattle and Tacoma to Japan and North China and monthly sailings from these ports to South China and Philippine Islands, the port of Shanghai being included in both routes. This line will also give additional service to other ports when cargo offerings warrant and no interference with maintaining the main schedule will result.

A hearing was held before the Senate commerce committee on February 3 at which some objections were made to the specifications for the sale as advertised by the board by representatives of some of the interests who desired to bid and again on February 6 at which some opposition was expressed by Commissioners Benson, Smith and Teller. The committee decided, however, not to consider the matter further until after receipt of bids on February 10. The board was asked to bring the bids to the committee for consideration by it and the committee decided not to make any recommendation. Senator Fletcher opposed the sale of the ships and it was reported that Commissioners Benson and Smith has voted against it.

Shipping Board Appropriation

Before passing the independent offices appropriation bill, carrying the appropriations for the Shipping Board, the Senate agreed to an amendment providing that not to exceed $10,000,000 should be taken from the board's construction loan fund for reconditioning of the *Mount Vernon* and *Monticello,* ex-German passenger ships, and that they should be reconditioned at a cost of not over $12,000,000. The amendment also provided that the ships should not be sold at less than the cost of reconditioning less a reduction of 5 percent annually for depreciation. As it passed the House the bill provided a direct appropriation for the reconditioning of the ships. An amendment offered by Senator Sackett, of Kentucky, that of the total appropriation of $13,400,000 for ship operating losses, $1,400,000 should be available for reconditioning and operating ten ships for use in the export coal trade, was adopted. Senator Copeland made an unsuccessful effort to reduce the appropriation to $12,000,000 and he protested vigorously against the proposal for the rehabilitation of "two broken-down old ships."

Equalization of Through Rates Proposed

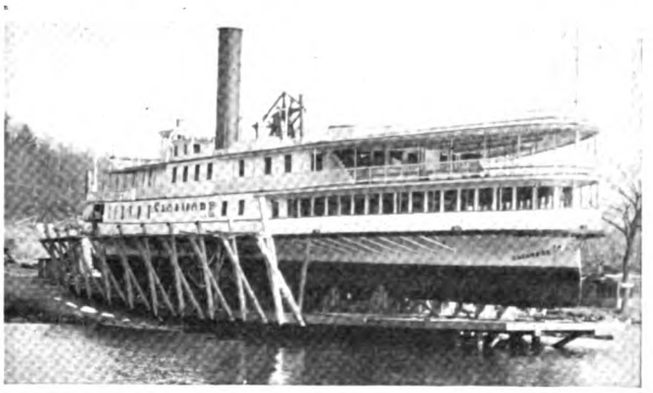
The Shipping Board has adopted a resolution directing the Fleet Corporation to take up with the North Atlantic U. K. Freight Conference the question of equalizing the through rates from Central Freight Association territory through all north Atlantic ports. The board said that equalization might be brought about either by raising the ocean rates through the north Atlantic ports south of New York and through Canadian ports or by reducing the rates through New York and Boston in an amount equal to the differential in rail rates to Baltimore.

Naval Appropriation Bill

Chairman Butler, of the House committee on naval affairs, reported to the House on February 28 a bill providing only for the construction of fifteen 10,000-ton cruisers, and one aircraft carrier, to be laid down in the next 3 years, at an estimated cost of $268,000,000. The committee estimated the cost of the cruisers at $17,000,000 each and the aircraft carrier at $19,000,000.

New Railway Dry Dock

THE Crandall Engineering Company, Boston Mass., has recently completed a railway dry dock for the Lake George Steamboat Company at Baldwin landing on Lake George, N. Y. The new railway is of the standard type and has a capacity of 800 tons actual weight with a keel block length of 190 feet and a clear breadth of 60 feet. It is of timber



New Crandall railway dry dock at Lake George

construction with the exception of the steel girders for main deck beams and it is powered with a standard steam hoist and manganese steel hauling chain.

Previously the cost of removing any one of the three steamers on Lake George was from $3,000 to $4,000 and the time required to haul out and return the vessel was from one to six weeks. The cost of doing the same work on the new Crandall railway is less than $30 and the time element is about one hour. This installation is expected to greatly reduce the cost of repairs and upkeep of the three steamers of the Lake George Steamboat Company.

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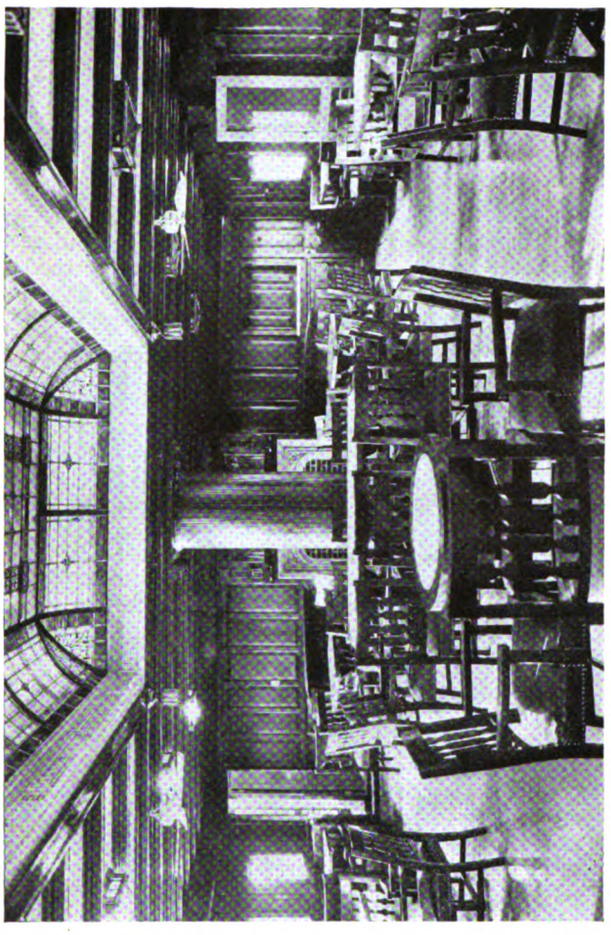
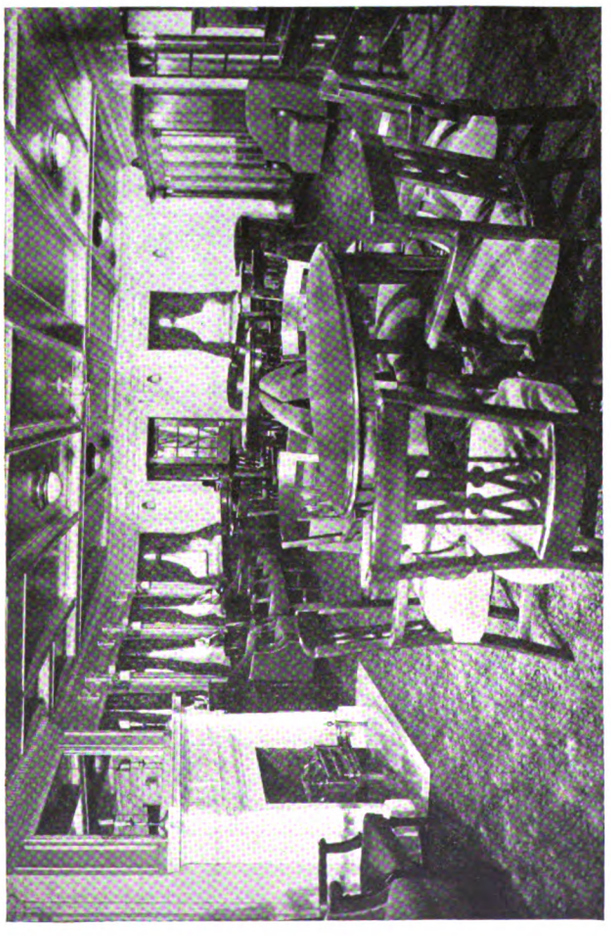


Smoking room

Observation sun parlor and dance room



Lounge and music room

Dining room

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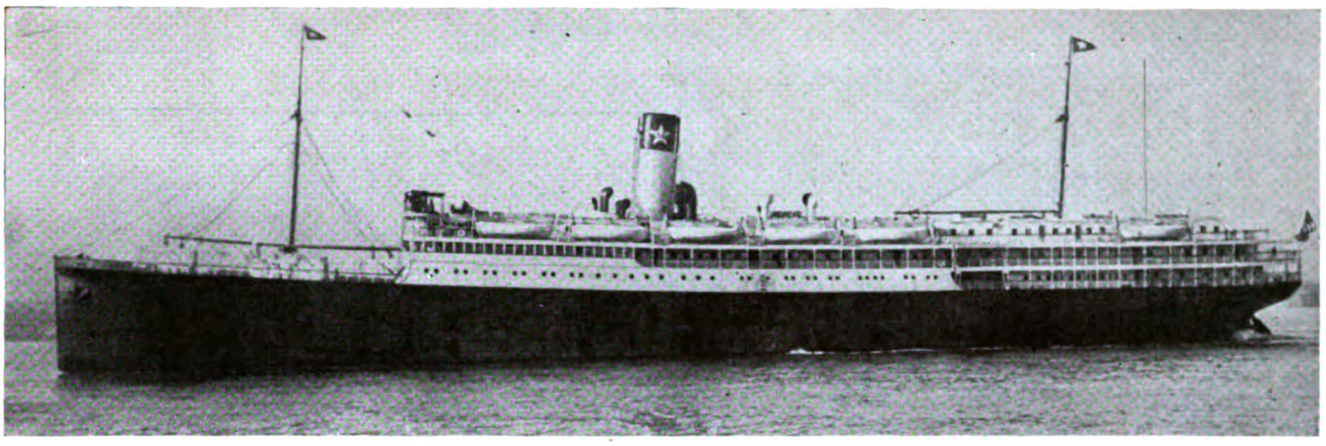

Southern Pacific passenger liner Dixie

The Passenger Steamship Dixie

Built by the Federal Shipbuilding Company for the Southern Pacific Steamship Lines

THE passenger service of the Southern Pacific Lines (the Morgan Line) between New York and New Orleans was augmented last month by the completion of the new geared turbine coastwise liner *Dixie*. This latest addition to the fleet was designed by A. S. Hebble, superintending engineer of the Southern Pacific Steamship Lines, who had immediate charge of construction under the direction of Lewis J. Spence, executive officer of the Southern Pacific Company, who personally supervised the arrangement, decoration and furnishing of the vessel.

The *Dixie* was built at the Kearny, N. J., yards of the Federal Shipbuilding and Dry Dock Company at an approximate cost of $2,400,000. The keel was laid on January 31, 1927; the vessel was launched on July 29, and the trial trip was carried out on December 10, 1927. The *Dixie* sailed from New York on her maiden voyage on January 28, 1928.

The *Dixie* is a single screw steamship of the hurricane deck type with straight stem and semi-elliptical stern, rigged with two steel pole masts. The hull is built on the Isherwood system with three complete steel decks fore and aft and a steel promenade deck with an orlop deck in addition in the forward hold, extending from the collision bulkhead to after No. 1 hold bulkhead. The vessel is fitted with wing and centerline hatches and side cargo ports. A double bottom extends throughout the length of the ship and under the deep fuel oil tanks is used for fuel and elsewhere for fresh water, ballast and boiler feed water. Deep fuel tanks are arranged forward and alongside of the fireroom and extend from the shell to the under side of the lower deck.

The hull is subdivided by 7 watertight bulkheads, extending to the saloon deck, and 2 oiltight bulkheads extending to the lower deck. The scantlings are equal to the requirements of the American Bureau of Shipping.

Main Particulars

The principal dimension and characteristics are as follows:

Length overall	445 feet
Length between perpendiculars	427 feet
Beam, molded	60 feet
Depth, molded to saloon deck	37 feet
Depth, molded to main deck	29 feet

Glass enclosed promenade deck

Fireplace in smoking room

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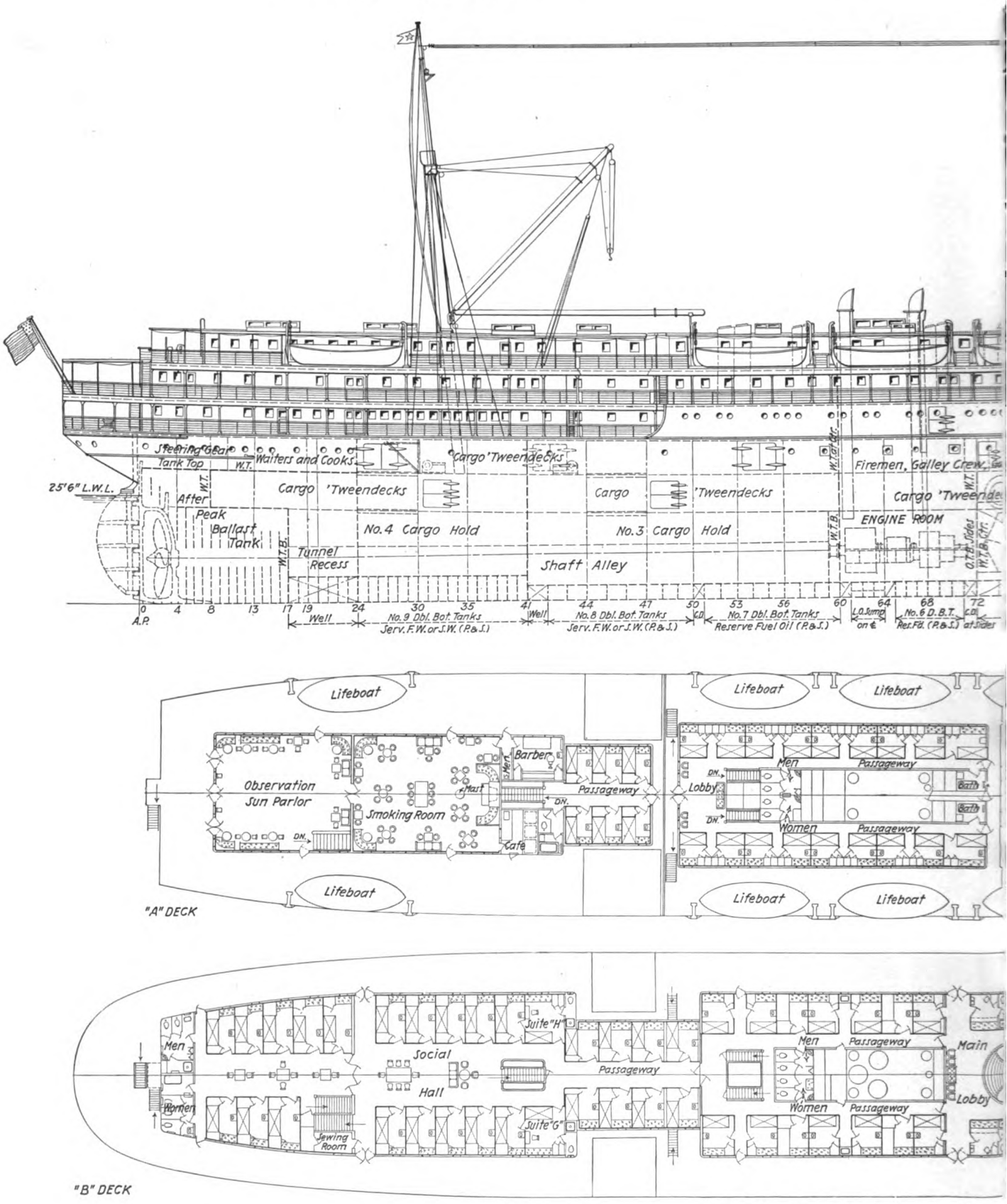

Profile and deck plans of Southern

Draft, mean	25 feet 6 inches	Shaft horsepower, normal	7,100
Cubic capacity, about	420,000 cubic feet	Speed, designed	15¾ knots
Gross tonnage	8,100 tons	Passengers, first cabin	279
Net tonnage	5,000 tons	Passengers, third cabin	100
Deadweight capacity, about	6,900 tons	Crew	114
Displacement	12,160 tons		

The passenger quarters are located on the saloon,

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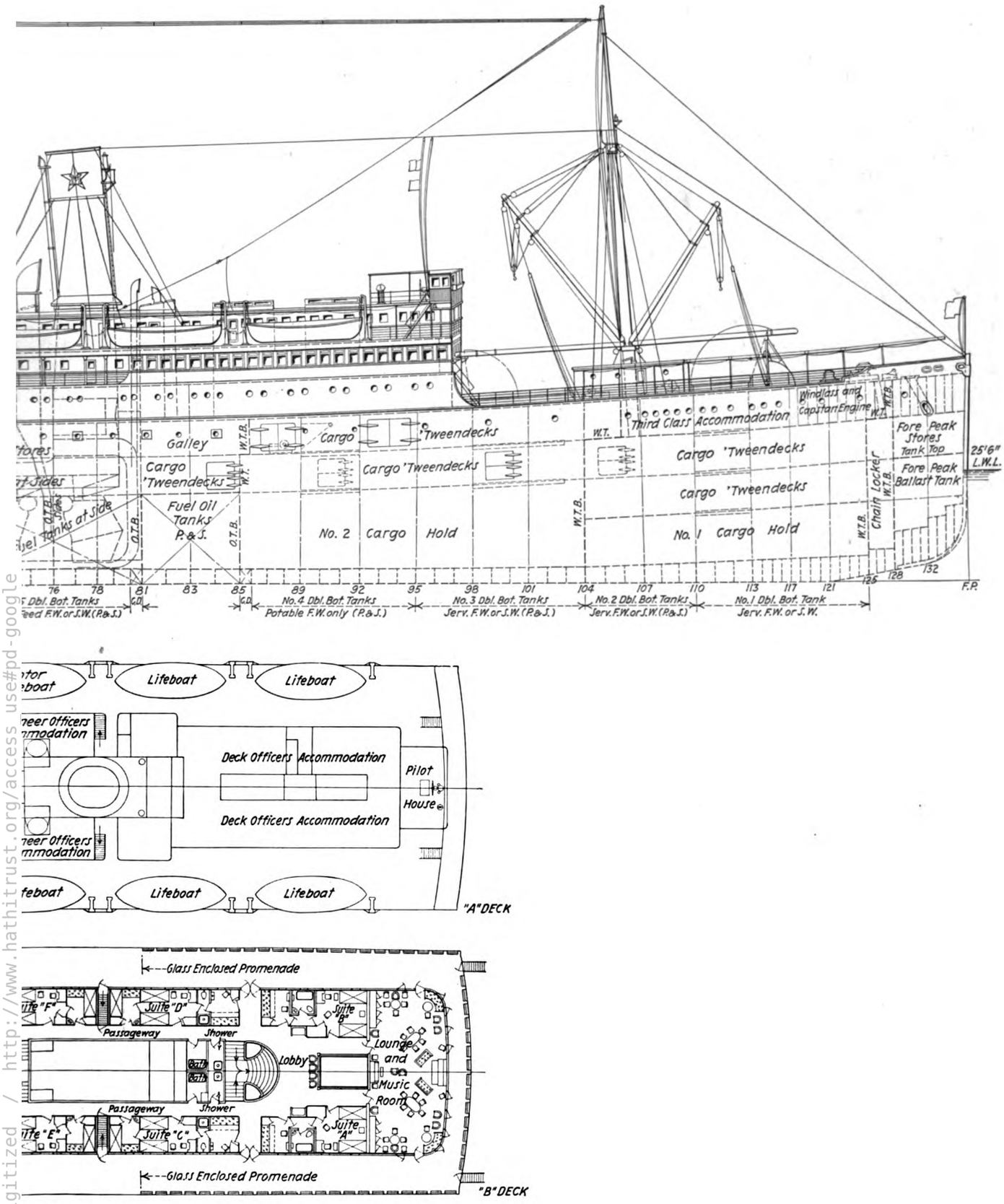

Pacific passenger steamship Dixie

promenade and boat decks. The deck and engine officers' quarters, together with the mess room and wireless rooms, are located on the boat deck around the boiler casing on the forward end. The waiters and cooks are located on the main deck aft and the firemen and oilers on the main deck amidships. The seamen are berthed in a deck house forward on the saloon deck. The promenade deck, approximately 8 feet wide, extends all around the superstructure, and is inclosed with sliding glass windows above the rail across the

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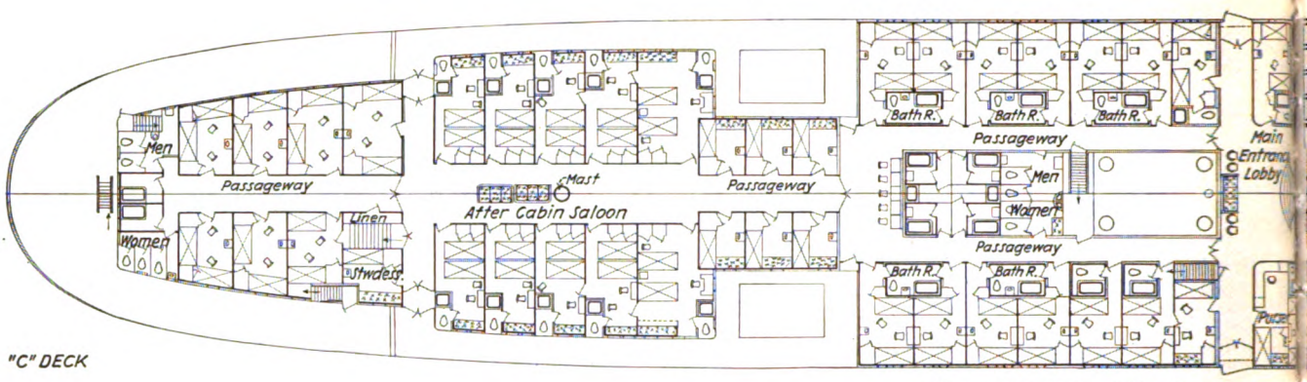


Plan of C deck of the Southern

forward end and aft on each side for a distance of 75 feet.

Passenger Accommodations

The interior decoration of the passenger accommodations is of American Colonial design. The social halls as well as the staterooms were designed and furnished tain, chief engineer, purser and chief steward. The public rooms consist of a dining saloon with tables for two, three, four, eight and ten persons, a lounge and music room, a writing room, a smoking room with cafe and barber shop, an enclosed observation sun parlor and dance room, and comfortable social halls. In addition to an electric piano in the music room, loud speakers are located in the dining saloon, sun parlor and dance hall and the lounge and music room for broadcasting both radio and phonograph entertainment. A telephone system connects all public rooms, social halls, suites and staterooms and the offices of the captain, chief engineer, purser and chief steward. The public rooms, social halls and passageways are heated by steam and the sleeping quarters by electro-vapor radiators. Cooled drinking water is circulated throughout the ship.

Accommodations have been provided for 279 first cabin and 100 third class passengers. All first cabin passenger accommodations consist of well-ventilated outside rooms, supplied with running hot and cold water as well as cooled drinking water, and are equipped with a full-length mirror fitted into a door or wall panel. Regular staterooms are equipped with a stationary lower berth and an upper berth of the Pullman type which can be closed when not in use, a number of these rooms being provided with toilets and shower baths. Other rooms are furnished with twin beds, dressing tables and adjoining toilets and baths. Several of these rooms are communicating, in addition to being provided with separate corridor entrances, and there are several de luxe suites, each embracing a twin-bedroom, sitting room and bath and toilet. The sitting room is provided with a settee berth and Pullman upper berth and a lavatory which provide the facilities of a bedroom when required. A supply of hot and cold salt water, as well as fresh water, is furnished to all baths.

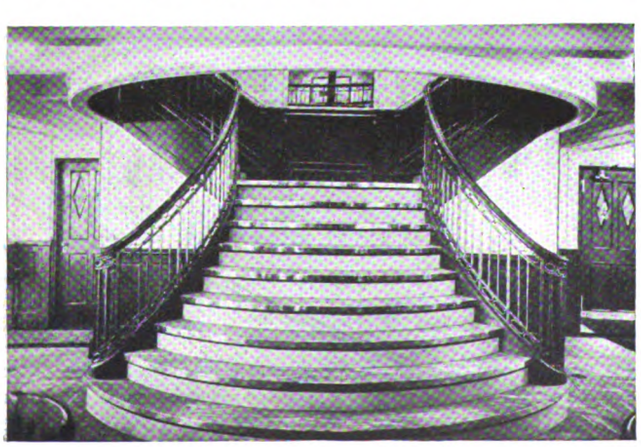
The deck covering in the passenger quarters is of tiled linoleum and in the halls, passageways and public spaces, of rubber tile. Mangansite floor composition is used in the officers' and petty officers' quarters and "glory hole" and mess rooms. The metal window frames and sashes on the boat and promenade decks were supplied by O. M. Edwards Company, Syracuse, N. Y.

Fire Prevention and Detection

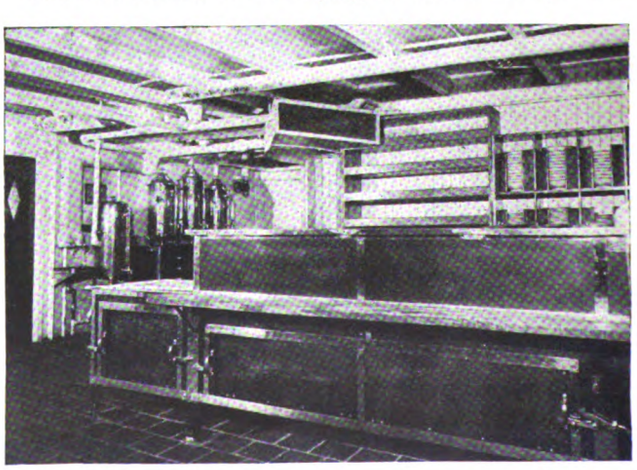
Particular attention has been given to fireproofing the vessel and the passenger quarters in particular. Fire resisting Vehisote is used throughout for the divisions, ceilings and panelings, and steel fire screen bulkheads are fitted throughout the accommodations and public rooms, with steel fire doors in the passageways. All staterooms are provided with a complete Atmo automatic fire alarm detector system.

A very comprehensive Lux-Rich system affords complete fire protection in the cargo and boiler spaces. The Rich detecting lines run to every cargo hold. In addition, the paint room and lamp rooms are protected, making a total of 17 lines for smoke detection. The Lux system for fire extinction consists of 155 cylinders of 50 pounds capacity located on the main deck. The cylinders are manifolded together and inter-connected so that the same gas supply can be used to extinguish a fire in the boiler room as well as in any cargo space.

The boiler room is also equipped with a straight Lux



Stairway from saloon to promenade deck



Pantry

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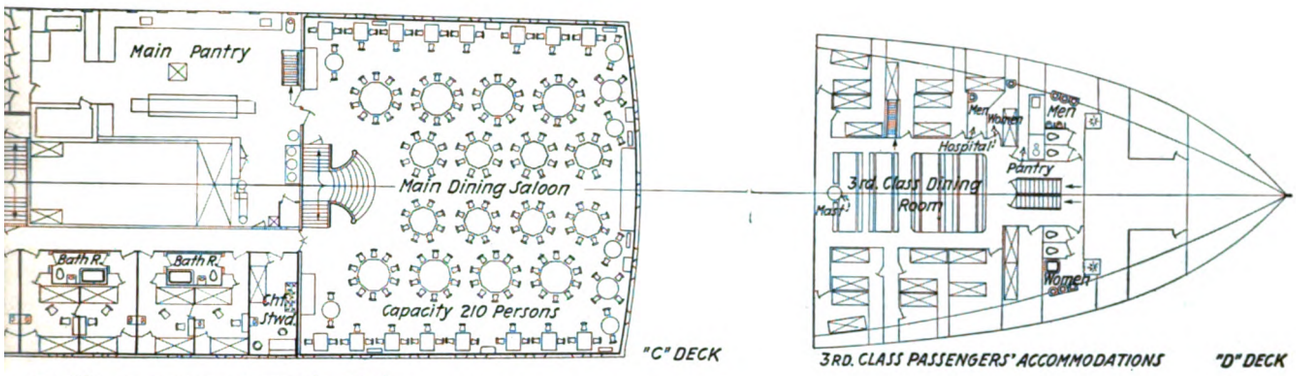


Pacific passenger steamship Dixie

system. Its protection consists of two forms known as bilge flooding and total flooding. The former type of equipment is for protection against fire in the bilges or on the tank top under the boiler room floor plates. The latter form will extinguish a fire anywhere in the boiler room, even a total conflagration.

Both the paint and lamp rooms are equipped with individual one-cylinder Lux systems. This makes it possible for a member of the crew to immediately extinguish a fire in one of these spaces, if it should break out while he is working there.

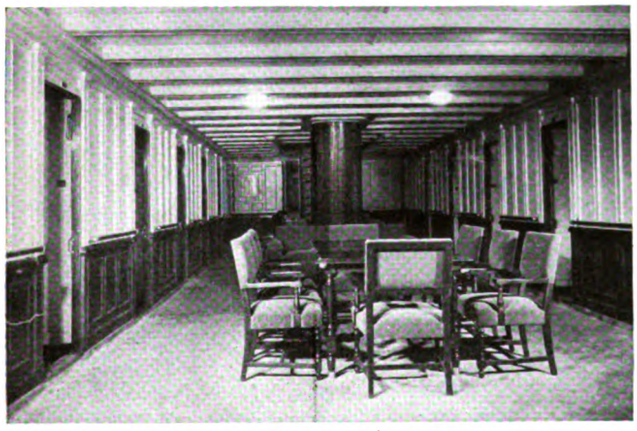
A manual alarm system is fitted at various intervals throughout the passenger spaces. In addition to this the cargo spaces are fitted with a steam fire-extinguishing system.

Life Saving Equipment

The vessel is equipped with the most modern life saving and wireless equipment. Twelve lifeboats are installed under Steward davits on the boat deck providing sufficient lifeboat capacity to take care of all persons on board. One of the lifeboats is a motorboat.

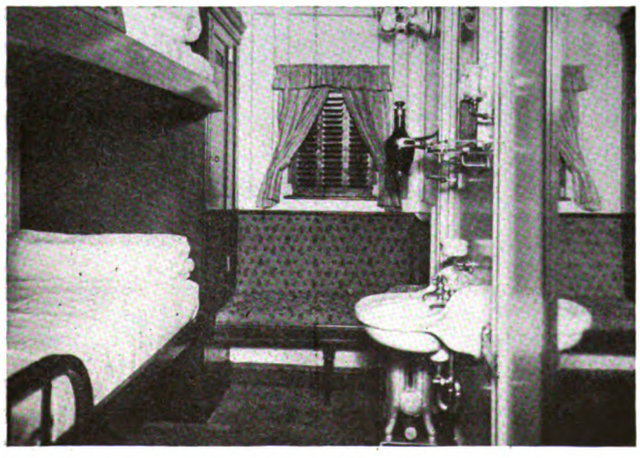
Steering Gear

The main steering gear is of the Hyde hydro-electric type, with an auxiliary steam steering gear of the right



Social hall

Lobby



First class stateroom

Bedroom with special suite

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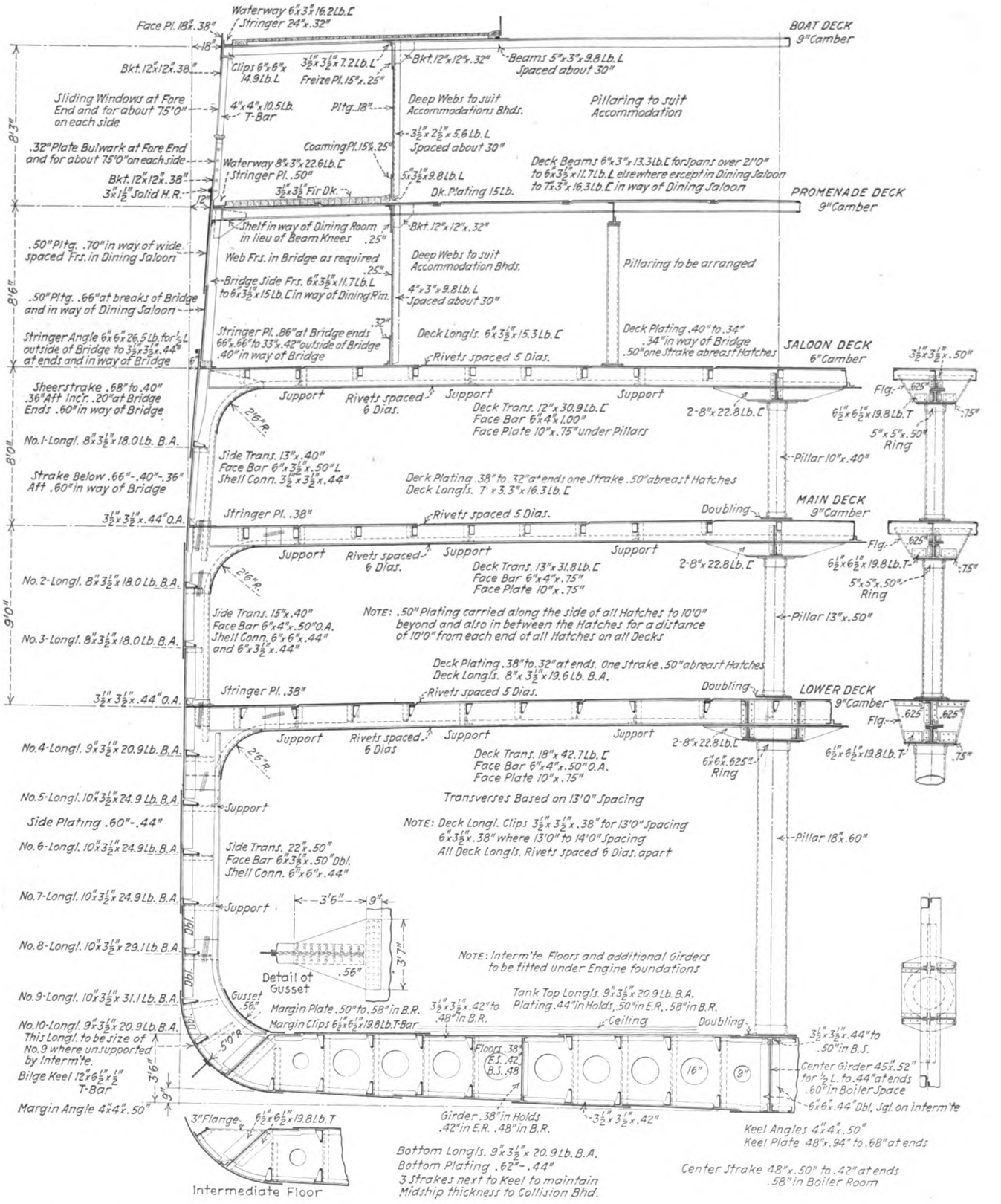
BOAT DECK
9" Camber
PROMENADE DECK
9" Camber
SALOON DECK
6" Camber
MAIN DECK
9" Camber
LOWER DECK
9" Camber
Waterway 6"x3½" 16.2 Lb. L
Stringer 24"x.32"
Face Pl. 18"x.38"
Bkt. 12"x12"x.38"
Clips 6"x6"x 14.9 Lb. L
3½"x3½"x.7.2 Lb. L
Freize Pl. 15"x.25"
Bkt. 12"x12"x.32"
Beams 5"x3"x9.8 Lb. L Spaced about 30"
Sliding Windows at Fore End and for about 75'0" on each side
4"x4"x10.5 Lb. T-Bar
Pltg. 18"
Deep Webs to suit Accommodations Bhds.
Pillaring to suit Accommodation
3½"x2½"x5.6 Lb. L Spaced about 30"
.32" Plate Bulwark at Fore End and for about 75'0" on each side
Coaming Pl. 15"x.25"
Waterway 8"x3"x22.6 Lb. L
Stringer Pl. .50"
Bkt. 12"x12"x.38"
3"x1½" Solid H.R.
3½"x3⅜" Fir Dk.
Deck Beams 6"x3"x13.3 Lb. L for Spans over 21'0" to 6"x3½"x11.7 Lb. L elsewhere except in Dining Saloon to 7"x3"x16.3 Lb. L in way of Dining Saloon
Dk. Plating 15 Lb.
Shelf in way of Dining Room in lieu of Beam Knees .25"
Bkt. 12"x12"x.32"
.50" Pltg. .70" in way of wide spaced Frs. in Dining Saloon
Web Frs. in Bridge as required .25"
Deep Webs to suit Accommodation Bhds.
Pillaring to be arranged
Bridge Side Frs. 6"x3½"x11.7 Lb. L to 6"x3½"x15 Lb. L in way of Dining Rm.
4"x3"x9.8 Lb. L Spaced about 30"
.50" Pltg. .66" at breaks of Bridge and in way of Dining Saloon
Stringer Angle 6"x6"x26.5 Lb. for ½ L outside of Bridge to 3½"x3½"x.44" at ends and in way of Bridge
Stringer Pl. .86" at Bridge ends 66"x.66" to 33"x.42" outside of Bridge .40" in way of Bridge .32"
Deck Longls. 6"x3½"x15.3 Lb. L
Rivets spaced 5 Dias.
Deck Plating .40" to .34" .34" in way of Bridge .50" one Strake abreast Hatches
Sheerstrake .68" to .40" .36" Aft Incr. .20" at Bridge Ends .60" in way of Bridge
Support
Rivets spaced 6 Dias.
Deck Trans. 12"x30.9 Lb. L Face Bar 6"x4"x1.00" Face Plate 10"x.75" under Pillars
2-8"x22.8 Lb. L
Flg. .625
6½"x6½"x19.8 Lb. T .75"
5"x5"x.50" Ring
26" R.
No. 1-Longl. 8"x3½"x18.0 Lb. B.A.
Side Trans. 13"x.40" Face Bar 6"x3½"x.50" L Shell Conn. 3½"x3½"x.44"
Pillar 10"x.40"
Strake Below .66"-.40"-.36" Aft .60" in way of Bridge
Deck Plating .38" to .32" at ends one Strake .50" abreast Hatches
Deck Longls. 7"x3.3"x16.3 Lb. L
3½"x3½"x.44" O.A.
Stringer Pl. .38"
Rivets spaced 5 Dias.
Doubling
No. 2-Longl. 8"x3½"x18.0 Lb. B.A.
Deck Trans. 13"x31.8 Lb. C Face Bar 6"x4"x.75" Face Plate 10"x.75"
Side Trans. 15"x.40" Face Bar 6"x4"x.50" O.A. Shell Conn. 6"x6"x.44" and 6"x3½"x.44"
NOTE: .50" Plating carried along the side of all Hatches to 10'0" beyond and also in between the Hatches for a distance of 10'0" from each end of all Hatches on all Decks
Pillar 13"x.50"
No. 3-Longl. 8"x3½"x18.0 Lb. B.A.
Deck Plating .38" to .32" at ends. One Strake .50" abreast Hatches
Deck Longls. 8"x3½"x19.6 Lb. B.A.
3½"x3½"x.44" O.A.
Stringer Pl. .38"
Rivets spaced 5 Dias.
Doubling
No. 4-Longl. 9"x3½"x20.9 Lb. B.A.
Deck Trans. 18"x42.7 Lb. C Face Bar 6"x4"x.50" O.A. Face Plate 10"x.75"
6"x6"x.625" Ring
No. 5-Longl. 10"x3½"x24.9 Lb. B.A.
Transverses Based on 13'0" Spacing
Side Plating .60"-.44"
NOTE: Deck Longl. Clips 3½"x3½"x.38" for 13'0" Spacing 6"x3½"x.38" where 13'0" to 14'0" Spacing All Deck Longls. Rivets Spaced 6 Dias. apart
Pillar 18"x.60"
No. 6-Longl. 10"x3½"x24.9 Lb. B.A.
Side Trans. 22"x.50" Face Bar 6"x3½"x.50" Dbl. Shell Conn. 6"x6"x.44"
No. 7-Longl. 10"x3½"x24.9 Lb. B.A.
3'6"
9"
3'7"
.56"
Detail of Gusset
No. 8-Longl. 10"x3½"x29.1 Lb. B.A.
Dbl.
NOTE: Interm'te Floors and additional Girders to be fitted under Engine foundations
No. 9-Longl. 10"x3½"x31.1 Lb. B.A.
Gusset .56"
Margin Plate .50" to .58" in B.R.
Tank Top Longls. 9"x3½"x20.9 Lb. B.A.
Plating .44" in Holds, .50" in E.R., .58" in B.R.
3½"x3½"x.42" to .48" in B.R.
Ceiling
Doubling
No. 10-Longl. 9"x3½"x20.9 Lb. B.A.
Margin Clips 6½"x6½"x19.8 Lb. T-Bar
This Longl. to be size of No. 9 where unsupported by Interm'te.
5'0" R.
Floors .38" E.I. .42" B.I. .48"
16"
9"
3½"x3½"x.44" to .50" in B.S.
Center Girder 45"x.52" for ½ L. to .44" at ends .60" in Boiler Space
Bilge Keel 12"x6½"x1" T-Bar
3'6"
9"
Margin Angle 4"x4"x.50"
6"x6"x.44" Dbl. Jgl. on interm'te
3" Flange
6½"x6½"x19.8 Lb. T
Girder .38" in Holds .42" in E.R. .48" in B.R.
3½"x3½"x.42"
Keel Angles 4"x4"x.50"
Keel Plate 48"x.94" to .68" at ends
Bottom Longls. 9"x3½"x20.9 Lb. B.A.
Bottom Plating .62"-.44"
3 Strakes next to Keel to maintain Midship thickness to Collision Bhd.
Center Strake 48"x.50" to .42" at ends .58" in Boiler Room
Intermediate Floor

Midship section

and left hand screw type. The steering gear is controlled by wire rope transmission from the pilot house, in addition to a Sperry gyro pilot control, fitted with a Sperry helm angle indicator. A Sperry gyro master compass with repeaters is also fitted. The magnetic compass was supplied by the Kelvin and Wilfrid O. White Company, Boston, Mass. A radio direction finder, supplied by the Radio Corporation of America, is installed in the pilot house.

Deck Machinery

The windlass and warping capstan, both steam driven, were supplied by the Hyde Windlass Company. The ground tackle includes 3 Baldt stockless anchors and 300 fathoms of 2⅜-inch Naco cast steel chain.

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The cargo handling apparatus consists of steel tubular booms, 2 on the forward side of the foremast, 2 on the after side and 2 on the forward side of the mainmast. Two cranes are fitted aft of No. 3 and two aft of No. 5 centerline hatches on the main deck.

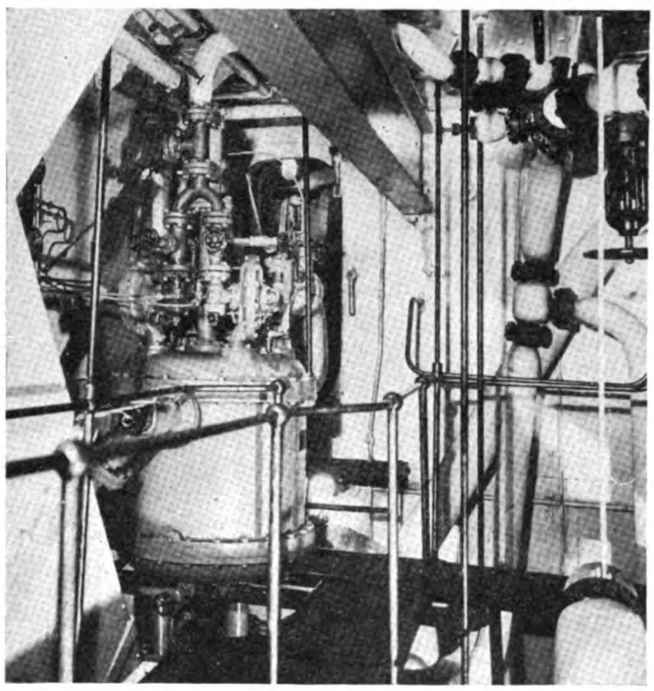
The hoisting gear consists of 10 Hyde Windlass Company 8¼-inch by 8-inch double cylinder single drum cargo winches.

The refrigerating apparatus consists of two 6-ton Brunswick compressors with a complete brine circulating system throughout the refrigerating boxes.

All light and heat is furnished by two 50-kilowatt and one 75-kilowatt General Electric generators driven by De Laval geared turbines. A 7½-kilowatt Winton generator is installed for emergency lighting.

Boilers

Steam is supplied at 350 pounds per square inch and superheated to 200 degrees F. by 4 oil-burning Babcock and Wilcox watertube boilers of the small tube type, having a total evaporating surface of 21,180 square feet and a total superheating surface of 2,048 square feet. Each boiler is fitted with 5 Cuyama type oil burners. The burners, ash pan, and furnaces are suitably protected by fire brick and non-conducting material. Each boiler is fitted with 6 Diamond soot blower units. Calorized units are fitted at the bottom of the first pass, protected by special alloy barriers. Each boiler is fitted with a Babcock and Wilcox latest type feed water circulator, a Wager smoke detector and a Bailey



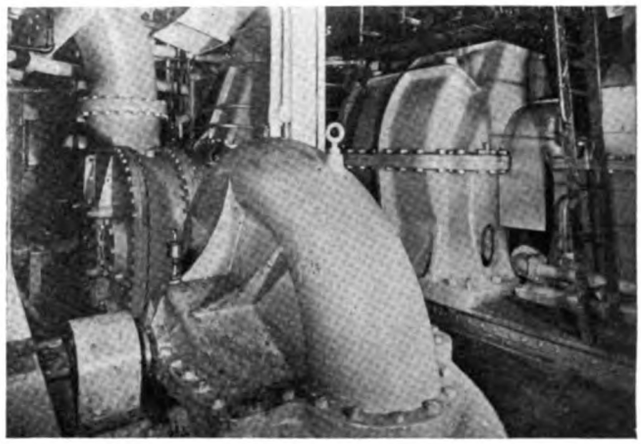
Looking forward at the upper grating in the engine room, port side, showing the main condenser radojet air ejectors and inter-after condenser

steam meter. A McNab simplex salt detector is fitted up complete in the engine room.

The boilers are arranged to operate under forced draft, which is supplied by two 78-inch, 3-stage bladed Sturtevant forced draft fans driven by an 8-inch by 7-inch balanced valve engine. A complete induced draft apparatus is fitted in the stack above the air heaters and consists of one No. 12 Sturtevant multivane single width, single inlet, design No. 3 fan driven by Sturtevant A-8-G turbo-transmission.

Each boiler is fitted with an air heater grouped above the boiler. The air heaters are fitted with tubes arranged so that the air makes two passages over the tubes. The air heaters are enclosed in a steel casing with an air space.

The oil fuel system is in duplicate with two Warren vertical duplex fuel pumps, 9 inches by 6 inches by 12 inches, arranged so that they can draw from the fuel



Lower engine room, port side, looking inboard, showing main condenser circulating pump and reduction gear

tanks and discharge through the heaters to the oil burners. There are 4 Todd heaters and a Warren vertical simplex fuel oil transfer pump, 10 inches by 10 inches by 24 inches. A Worthington 2-inch fuel oil meter is also fitted.

The feed water is handled by 1 centrifugal main feed pump, turbine driven, having a capacity of 135 gallons per minute, manufactured by the De Laval Steam Turbine Company, and 1 Warren vertical simplex auxiliary feed pump, 16 inches by 10½ inches by 24 inches. The feed water is heated from 100 to 235 degrees F., when operating at full power, by a Paracoil heater supplied by the Davis Engineering Company.

Propelling Machinery

The propelling machinery was built in accordance with the rules of the United States Steamboat Inspection Service and the requirements of the American Bureau of Shipping. Propulsion is by a single screw driven by one set of compound turbines through double reduction gears. The engine foundations are exceptionally heavy and are not attached to the transverse bulkheads so that the engines are not affected by the twisting or vibration of the hull.

The main propelling unit, manufactured by the De Laval Steam Turbine Company, Trenton, N. J., consists of one high pressure turbine and one low pressure turbine in series, connected through flexible couplings to double reduction gears, all of which is of very heavy and rugged construction. The slow speed gear shaft is directly coupled to the line shafting. The astern turbines are in series and are arranged in the exhaust ends of both ahead turbines. The normal rated capacity of the main unit is 7,100 shaft horsepower at a propeller speed of 91 revolutions per minute, although the unit can develop a maximum of 8,000 shaft horsepower. The low pressure turbine exhausts through the bottom of the casing directly into the condenser arranged athwartship underneath. With this arrangement the exhaust pipe is eliminated and the low pressure casing can be lifted by breaking only one joint. The high pressure casing can be lifted by breaking three joints,

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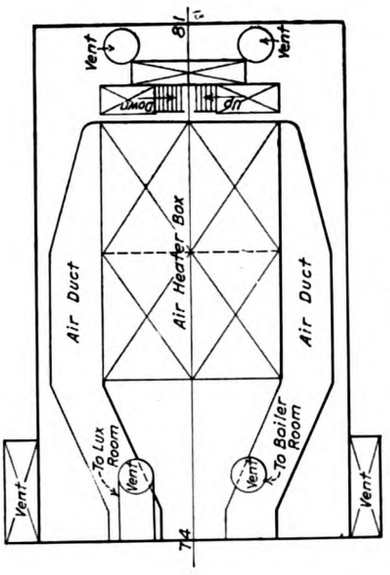
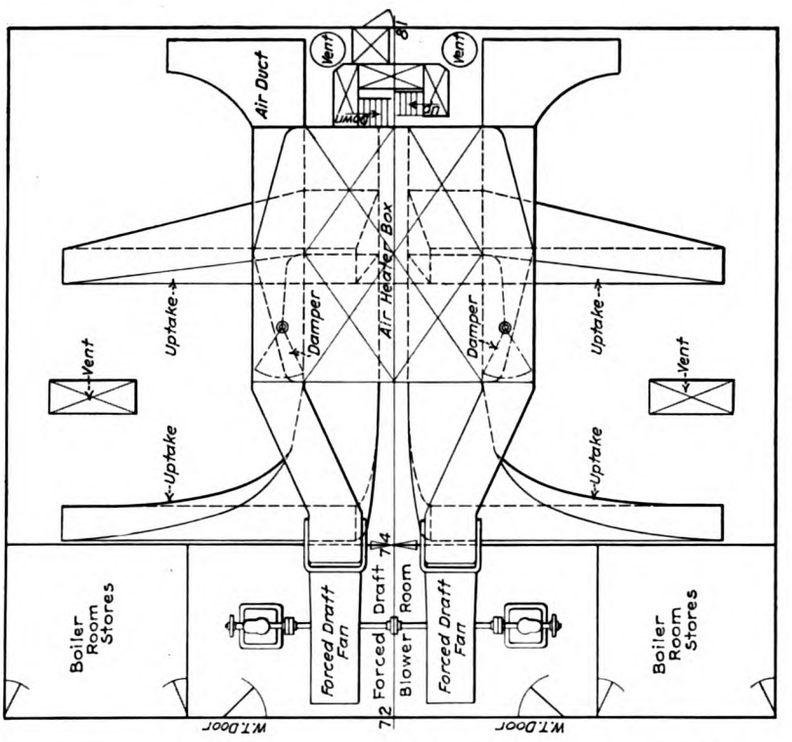
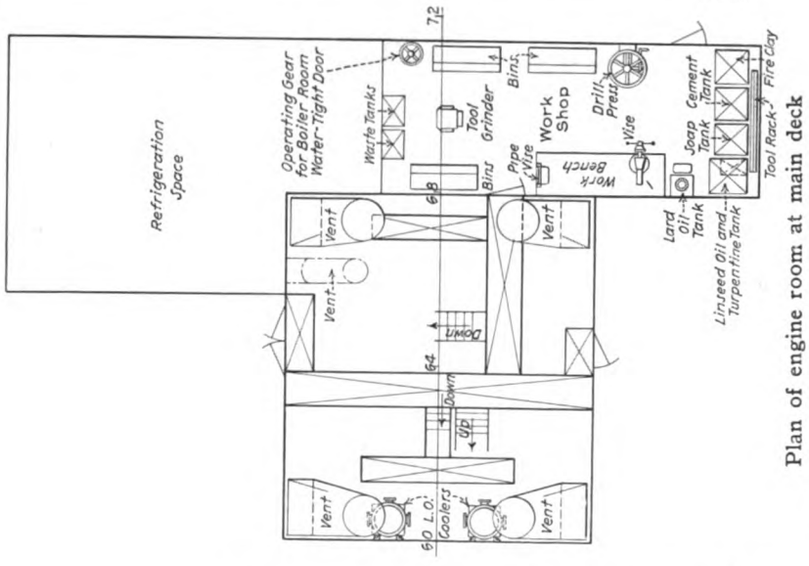


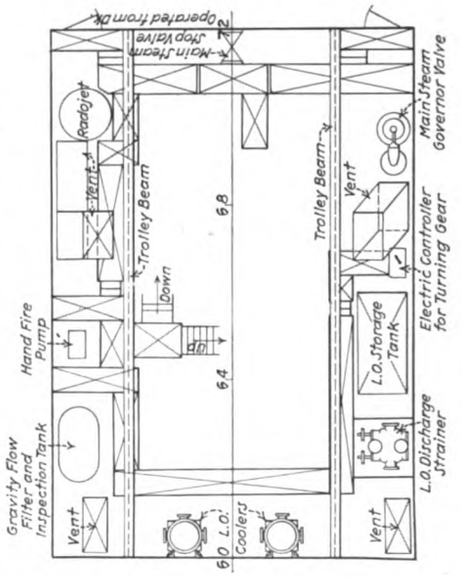
Plan of boiler room at main deck



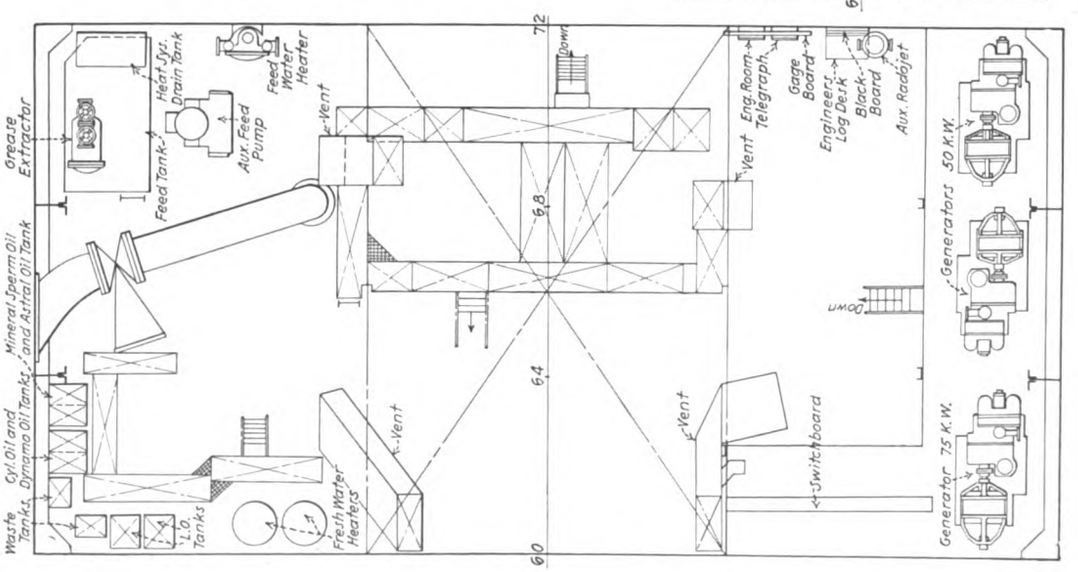
Plan of boiler room at lower deck



Plan of engine room at main deck



Plan of engine room at lower deck



Engine room flat

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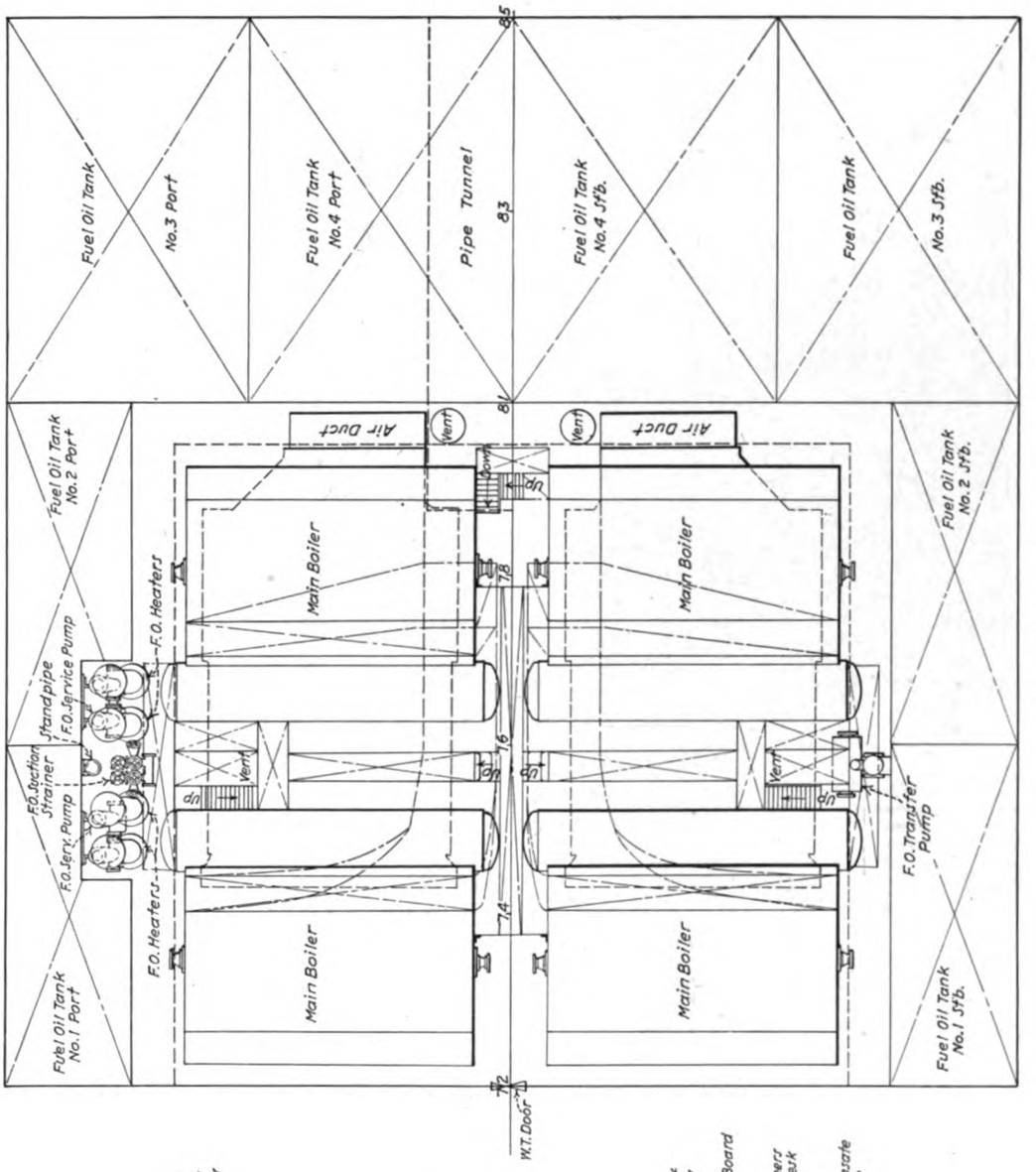
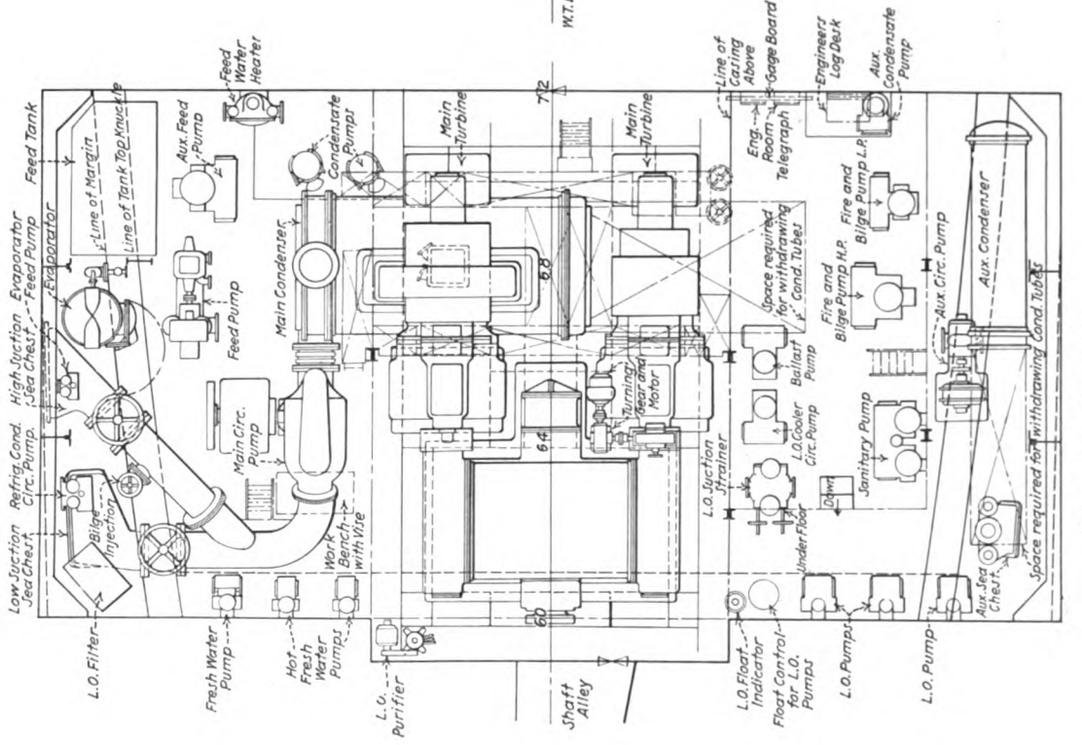


Plan of boiler room



Plan of engine room

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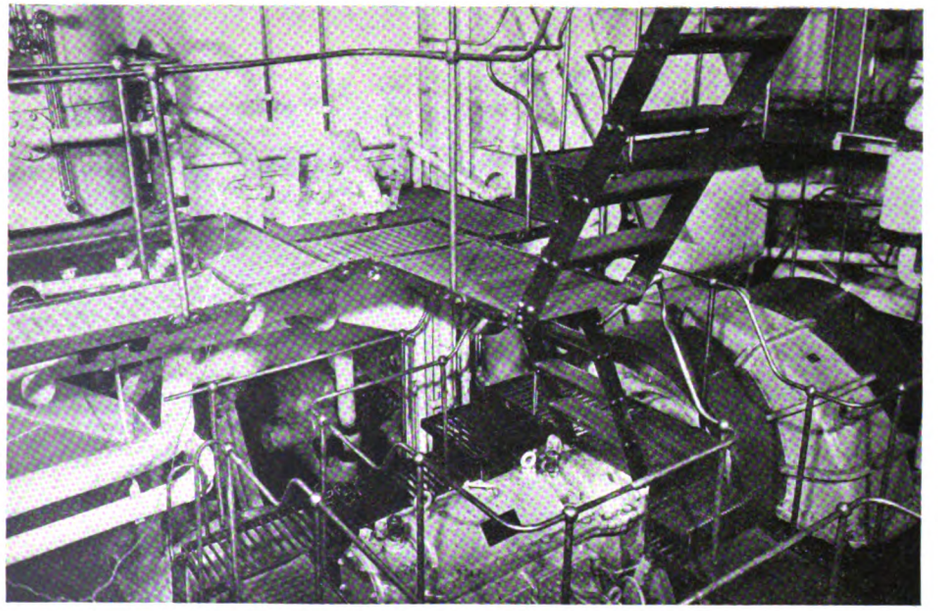
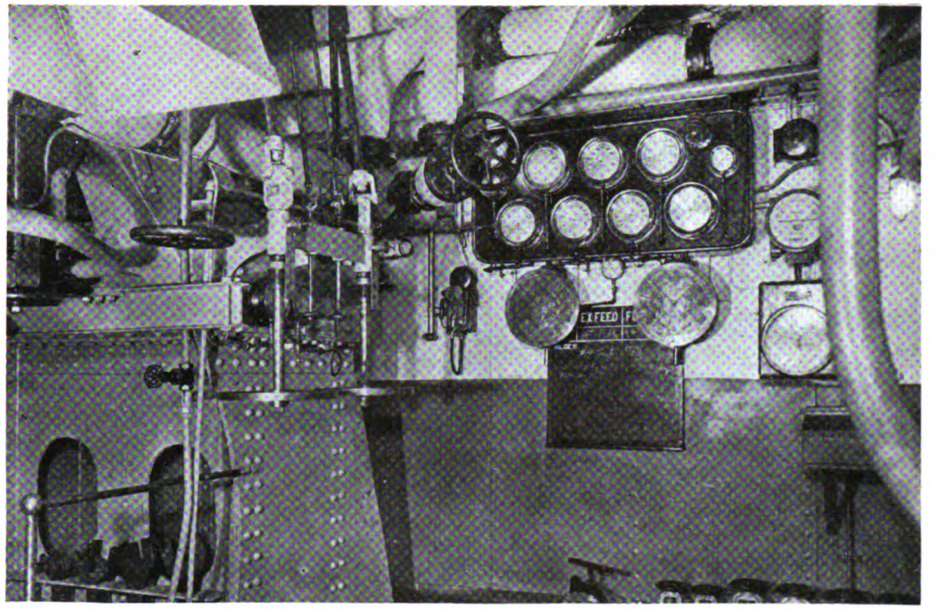
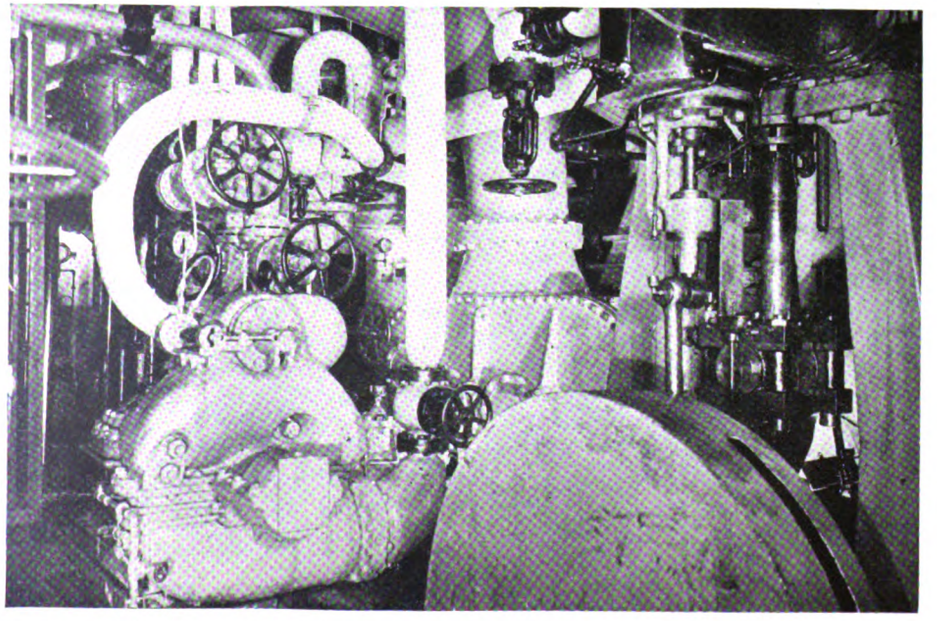


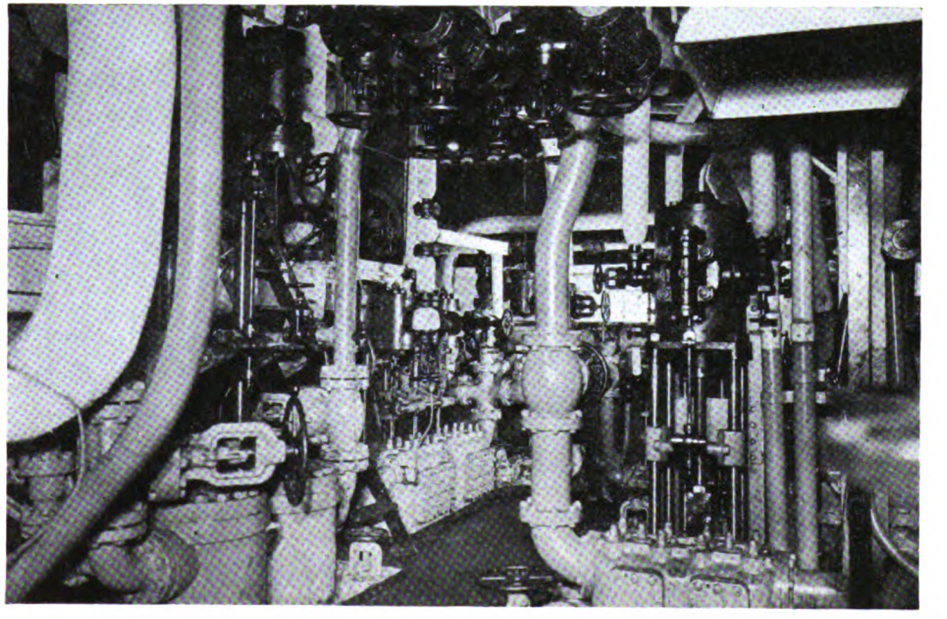
View of engine room from middle grating, port side, showing low pressure turbine and reduction gear



Lower engine room, starboard side, looking forward, showing operating station



Lower engine room, port side, looking forward, showing circulating pump engine and main turbine driven feed pump



Lower engine room, starboard side, looking forward, showing oil strainers, sanitary, bilge and ballast pumps

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one horizontal and two vertical. The operating platform is on the level of the engine room floor.

The turbines are designed to operate with steam at 330 pounds gage pressure and 200 degrees F. superheat at the high pressure ahead and astern nozzles. The revolutions of the turbines at normal power are 3,250 and of the propeller at this power 91 per minute. The turbines are designed to operate at as near maximum efficiency as possible at all powers above 50 percent.

The high pressure casing is of cast steel and the low pressure casing of cast iron, both divided along the horizontal centerline with the two halves bolted together. The steam chests for both the ahead and reversing elements are of cast steel. The rotor wheels ar forged steel disks, finished all over and designed to withstand speeds 75 percent in excess of the normal operating speeds. The shafts are heavy steel forgings tapering from the center to the ends to raise the critical speed 100 percent above the normal running speed.

Each turbine is fitted with a thrust bearing in order to maintain the proper position of the rotor and to determine clearances of the turbines. The turbines are also provided with a non-tripping speed governor, limiting the speed to a maximum of 10 percent above normal. A complete arrangement of throttle valve control is fitted. The working parts of the turbines are built to limit gages and are interchangeable. Forged monel metal blading is fitted throughout. Stainless steel rust proof sleeves are fitted next to the carbon packings to eliminate destructive corrosion in the bearings.

The main steam piping is 8 inches in diameter and all piping, flanges and valves are made to withstand 1,400 pounds test pressure. All piping, flanges and valve bonnets are thoroughly covered with insulation supplied by Thorsen and Company to reduce the pressure and temperature losses between the superheaters and turbine to a minimum. All of the auxiliary piping and machinery is built to take full boiler pressure in order to eliminate all danger from the admission of live steam.

Double Reduction Gearing

The double reduction gear is arranged in three separate casings. The gearing is of the double helical type. The wheels of the first and second gears have cast iron centers and forged steel rims. The pinions of the first and second gears are of nickel steel. The main thrust is fitted at the forward end of the low speed gear case and secured to the tank top. Flexible couplings are arranged between each turbine rotor shaft and pinion and between the first reduction gear wheel and the second reduction pinions, to allow for axial and slight lateral movement.

The line shaft is of steel with solid forged couplings. The thrust shaft is of steel with solid forged couplings and fitted with a composition sleeve. A torsion meter of the Denny-Edgecomb type is attached to the propeller shaft.

The turbine bearings, gear bearings, thrust and gear teeth are lubricated from a gravity lubricating system. This system is maintained by 3 Warren vertical simplex pumps 8 inches by 10 inches by 12 inches, arranged so that two are working and one standing idle in case of emergency.

The propeller is of the right handed, four bladed, built-up type with cast steel hub and manganese bronze blades. The driving face of the blades is machined and polished and the back of the blades ground and polished.

Auxiliaries

The main condenser has 9,760 square feet of cooling surface. The tubes and ferrules are of solid drawn Admiralty mixture. The tubes are made watertight in the tube sheets by screwed glands packed with corset lacing. The condenser, together with the condensing equipment, is designed for maintaining 28½ inches of vacuum with sea water at 65 degrees. The auxiliary condenser is similar to the main condenser and has 1,600 square feet of cooling surface.

The main condenser is fitted with two 2-stage Wheeler radojet air ejectors, fitted with inter-after condensers provided with automatic drain control. The auxiliary condenser is fitted with one Wheeler radojet air ejector with after condenser provided with automatic drain control. The radojets on the main condenser are independent and in duplicate. There are two vertical centrifugal Bethlehem condensate pumps, driven by Diehl motors, arranged in duplicate. The auxiliary condensate pump is a Warren vertical simplex pump, 6 inches by 8 inches by 8 inches.

The main circulating pump is of the centrifugal type with a normal capacity of not less than 16,000 gallons per minute. The diameter of the suction at discharge is 24 inches. The pump is operated by a single cylinder engine. The impeller is of brass and the shaft of Tobin bronze running in bronze bearings. The auxiliary circulating pump is a motor driven centrifugal pump with a 10-inch suction.

In addition to the above equipment, the following auxiliaries are installed:

1 Davis grease extractor
1 Davis evaporator, capacity 30 tons per 24 hours
1 Andale distiller capacity 2,000 gallons per 24 hours
2 Cory engine room telegraphs
2 Andale lubricating oil coolers, capacity 225 gallons per minute each
1 De Laval lubricating oil purifier
1 Warren vertical simplex lubricating oil cooler circulating pump, 12 inches by 14 inches by 18 inches
1 Warren vertical simplex fire and bilge pump (L. P.), 14 inches by 10 inches by 18 inches
1 Warren vertical simplex fine and bilge pump (H. P.), 16 inches by 10½ inches by 24 inches
1 Warren vertical simplex ballast pump, 12 inches by 14 inches by 18 inches
1 Warren vertical simplex fresh water pump, 7 inches by 8 inches by 12 inches
1 Warren vertical duplex sanitary pump, 10 inches by 12 inches by 12 inches
1 Warren vertical duplex evaporator feed pump, 5¼ inches by 3½ inches by 6 inches
2 Warren vertical simplex hot fresh water pumps, 6 inches by 7 inches by 12 inches
1 Warren vertical duplex refrigerating condenser circulating pump, 6 inches by 6 inches by 6 inches
1 Davis gravity flow filter and inspection tank
1 Gould hand-fired pump.

GERMAN SHIPYARDS COMBINE.—For the purpose of affecting economies 9 of the shipbuilding companies in Germany will be amalgamated. Among them are the Deutsche Schiff-und Maschinenbau Aktiengesellschaft at Bremen; Aktien-Gesellschaft Neptun at Rostock; and Neuschke and Company at Stettin; the Vulcan at Bremen; and the Seebeck Werft at Geestemuende. Those of the less modern yards, not suited to compete successfully under present day conditions, will be closed. The large companies, such as Deutsche Werft and Blohm and Voss, are not involved, because their present situation is sufficiently strong to enable them to compete successfully for German and foreign shipbuilding business.

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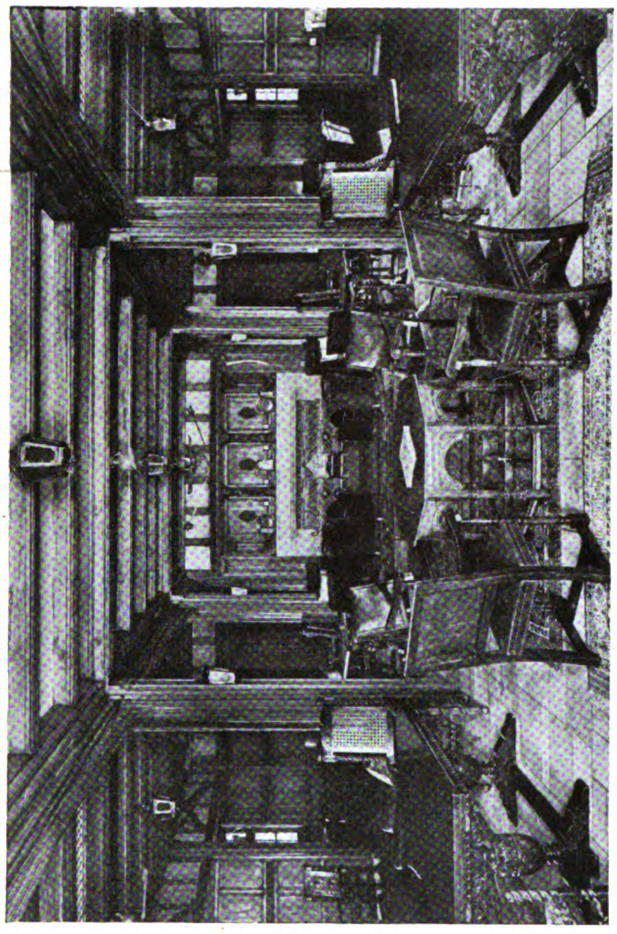
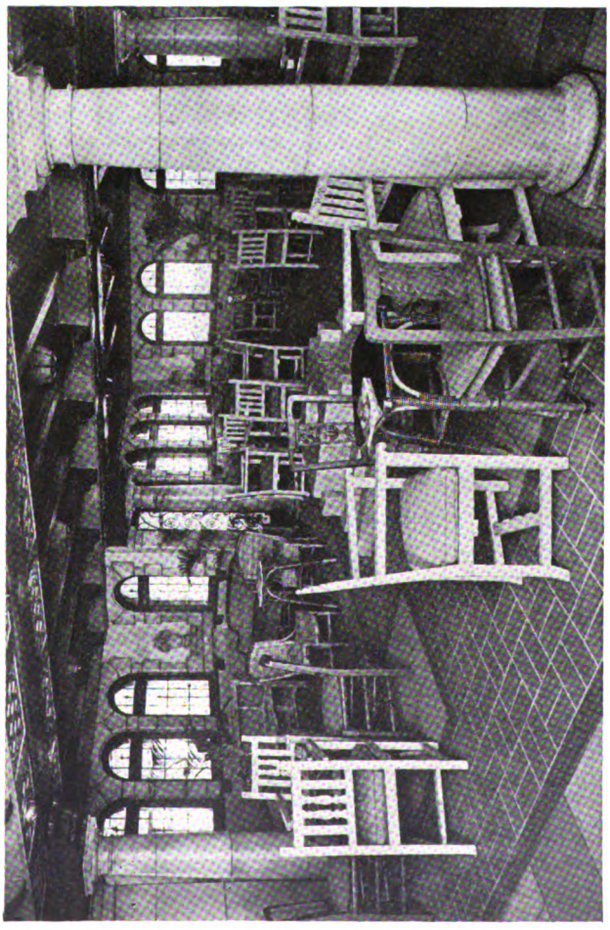
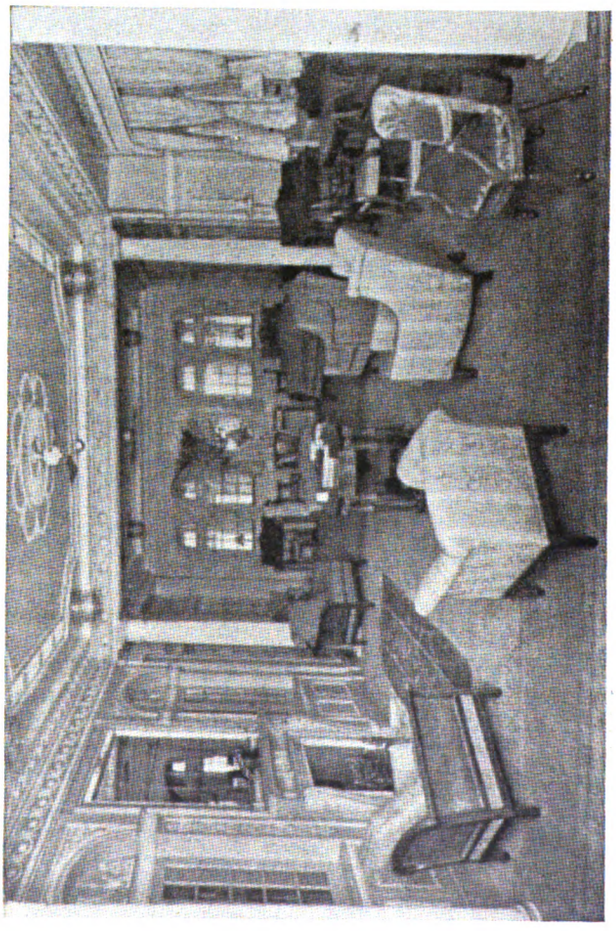


Smoking room

Dining room



Terrace café



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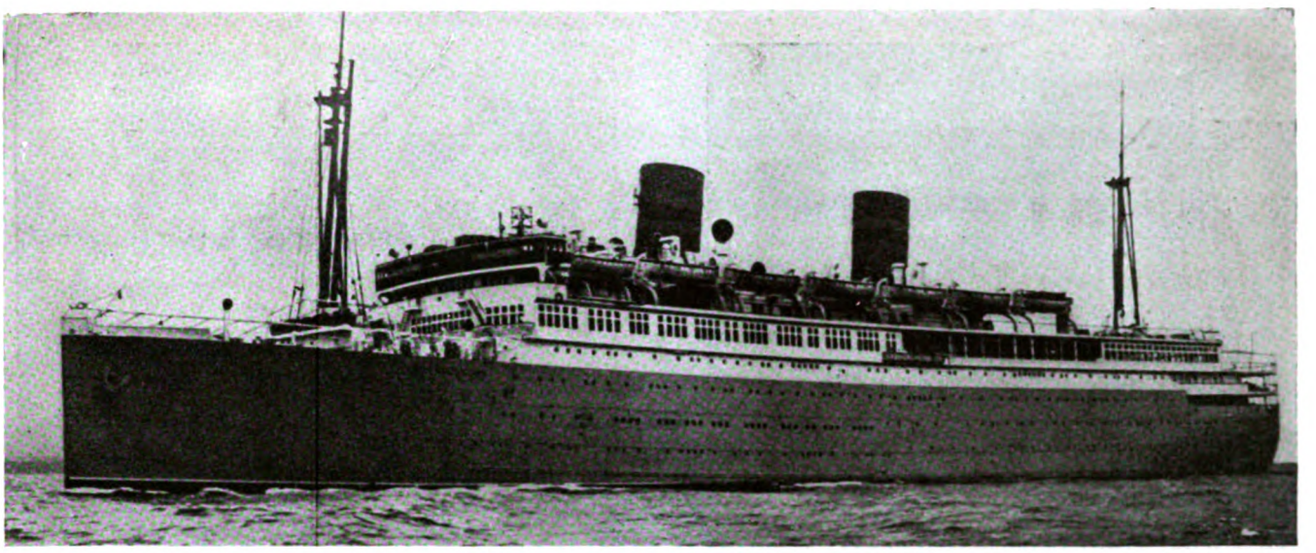

The 19,000-ton motor liner Bermuda

The Passenger Motor Liner Bermuda

Quadruple screw, 17-knot, 19,000-ton vessel for the New York-Bermuda service

By Our London Correspondent

WHEN, toward the end of the summer of 1926, the Furness, Withy Line placed an order with the Belfast firm of shipbuilders, Workman, Clark and Company, for a luxury passenger liner to convey passengers from New York to Bermuda, it was stipulated that she should be completed before the end of 1927. It was only by working day and night towards the end that the builders were able to fulfill this requirement, and it is of some significance, as indicating the way in which the marine oil engine has developed, that the manufacturers of the propelling machinery had to design, build and install an entirely new type of motor within this somewhat limited period. It should be added that the ship sails under the flag of the New York and West Indies Steamship Service, Ltd., one of the subsidiaries of the Furness, Withy group, and that, in addition to her New York-Bermuda service, she will make a series of long pleasure cruises, possibly around the world.

She has attracted considerable interest in European shipping and shipbuilding circles, quite apart from the interest that normally attaches to a passenger liner of this size. She represents the first big passenger ship to be equipped with Doxford opposed piston oil engines, and, as mentioned, these are of a new type with certain noteworthy features. She is also a quadruple screw vessel, and thus has a bearing on the burning question whether quadruple screw propulsion is more satisfactory than the twin screw system for large oil-engined craft.

Lounge

The following are the leading details of the *Bermuda*:

Length over all	547 ft. 0 ins.
Beam, molded	73 ft. 9 ins.
Depth to C deck	45 ft. 0 ins.
Draft	24 ft. 6 ins.
Gross tonnage	19,086
Passengers:	
First Class	616
Second Class	75
Total	691
Number of engines	4
Total engine power (normal)	12,000 b.h.p.
Total engine power (maximum)	14,000 b.h.p.
Speed	17-18 knots
Cargo capacity (refrigerated)	64,000 cu. ft.
Cargo capacity (unrefrigerated)	84,000 cu. ft.

Passenger Accommodations

The accommodations of the public rooms are not quite along the stereotyped lines of the average passenger ship, which is, perhaps,

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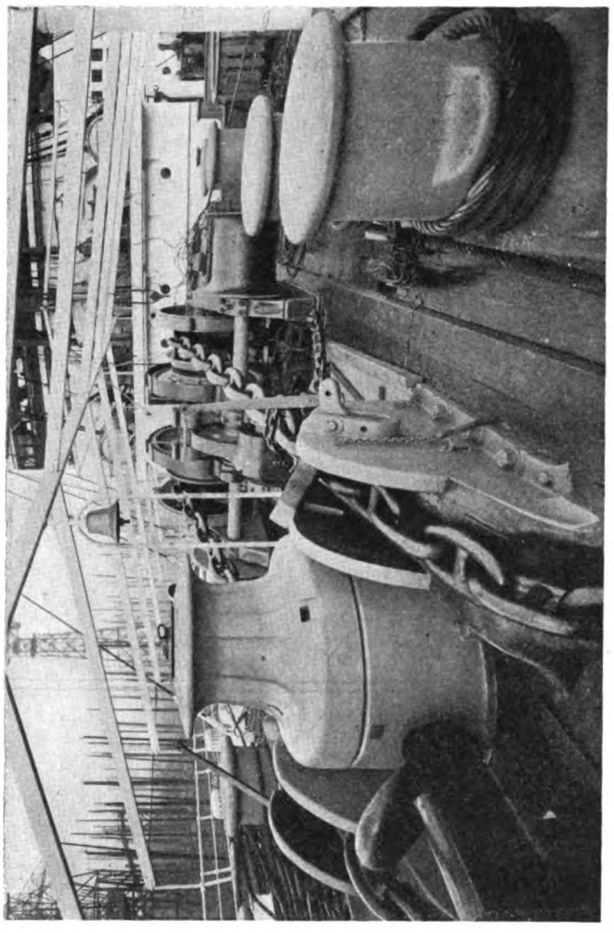
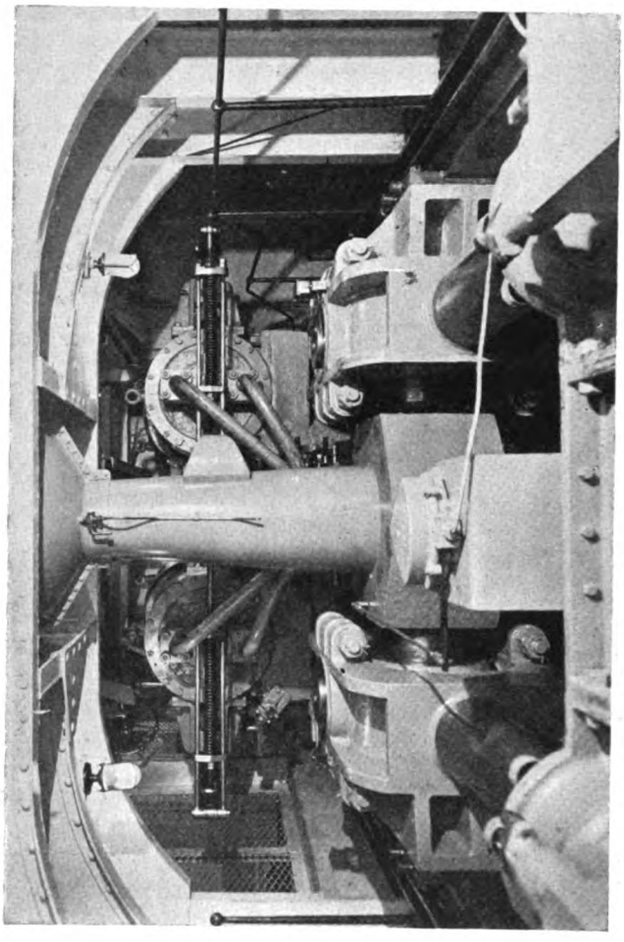
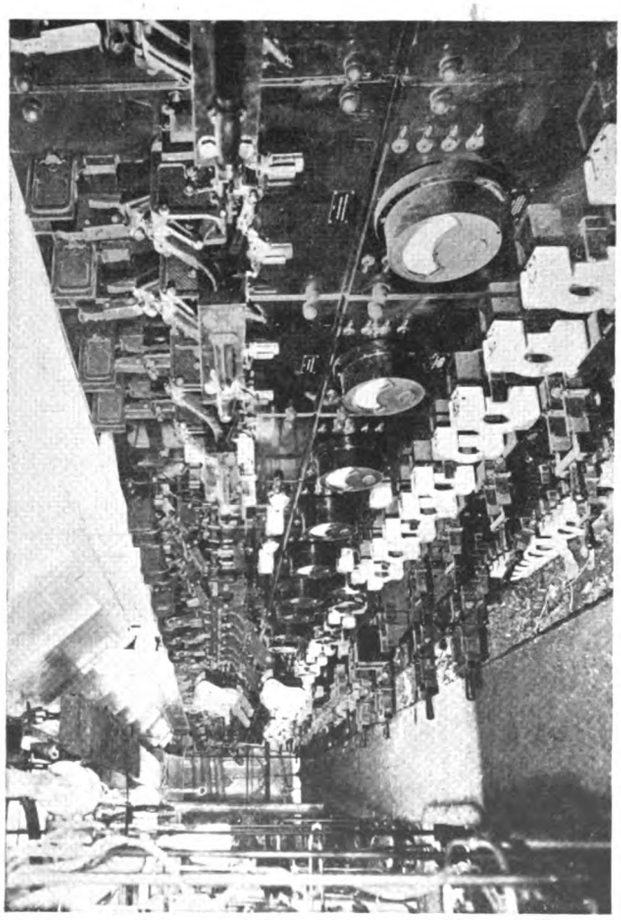


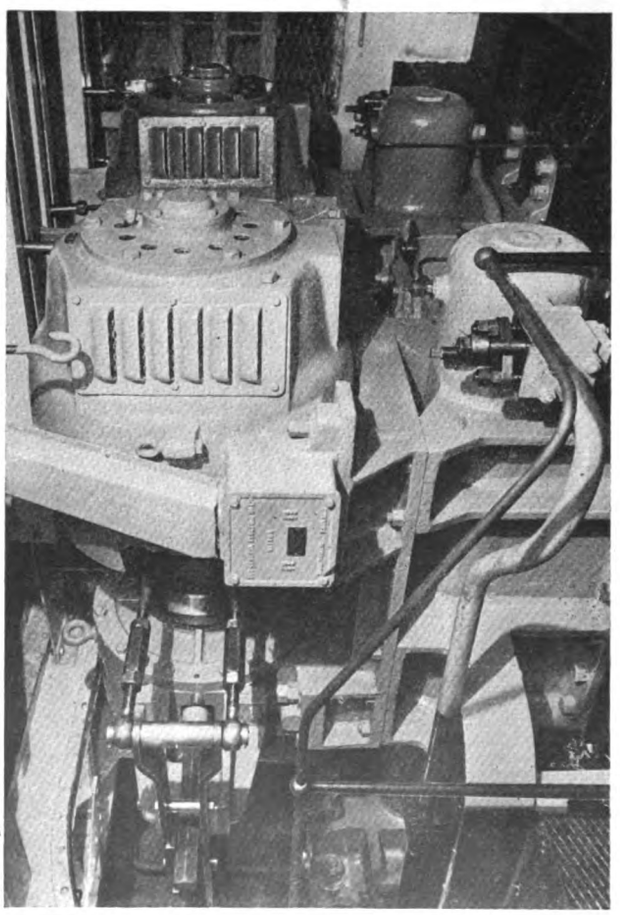
Windlass and forward capstan



Steering gear



Main switchboard



55 horsepower steering gear motor

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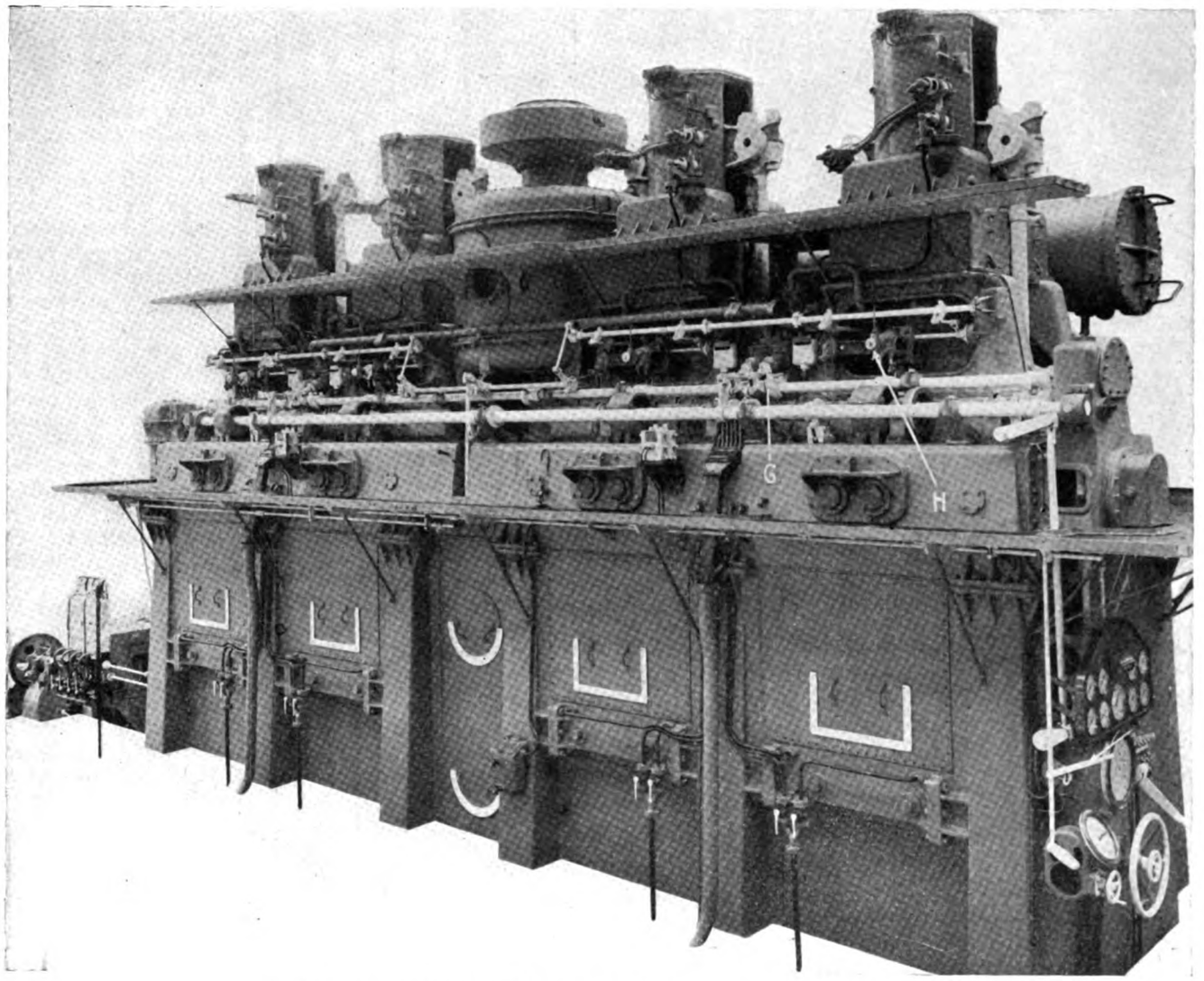
natural in view of the special service of this vessel. On the sun deck, right forward, is what is termed an observation lounge, and this connects port and starboard with the first class entrance amidships by two long lounge balconies. Two of the de luxe suites are on this deck as well as the gymnasium, and a very large space is available aft for dancing, further accommodation for the same purpose being provided on A deck below. Two sides of this room have plate glass windows and the decoration is in modern French style. Loud speakers have been installed in this and all the other main saloons.

On the deck below (A deck) are the main public rooms, the writing room right forward, the big social hall following, with the smoking room and Spanish terrace café aft, the latter leading on to a large dancing space. The writing room is in the Adam style, the furniture being of mahogany, while many of the chairs reproduce XVIIIth century models. The room has Adam gilt mirrors on the side walls between the windows.

The social hall is the most imposing saloon in the ship, being 80 feet long and 42 feet wide, while it is three decks in height beneath the domes. The balconies referred to above extend the entire length on each side. Georgian style is employed, and there is a stage where theatrical performances may be given and a cinematograph outfit is naturally available for entertainment.

The smoking room leads out of an oak panelled entrance hall, and is itself oak panelled, being divided up centrally by heavily molded Tudor arches. A stone fireplace gives a distinctive note at the after end, the mantelpiece being adorned with old Scotch Tudor. It has a wood fire, in a wrought iron Sussex grate.

A few cabins are arranged on A deck, but they are mostly disposed on B, C, D and E decks. They incorporate two de luxe suites on B deck each of which has its own veranda with two bed rooms, a sitting room and box room. Quite a large number of the cabins, specially those on C and E decks, are arranged to accommodate three passengers, the number for one passenger being distinctly limited.



One of the four 2,800 to 3,400 brake horsepower Doxford propelling engines

The dining saloon is on D deck and is 110 feet long and 72 feet broad. It is three decks in height and concealed lighting has been provided in the dome. The scheme of decoration is an adaptation of the Greek style, and a feature of the dining saloon, which is necessary for a ship engaged in such a service, is the provision of the cold buffet at the after end. The tables and chairs, which are of mahogany, are on the lines of the late XVIIIth century English furniture, the covering being in opal blue and gold. There are tables for two, four and six persons, the total seating capacity

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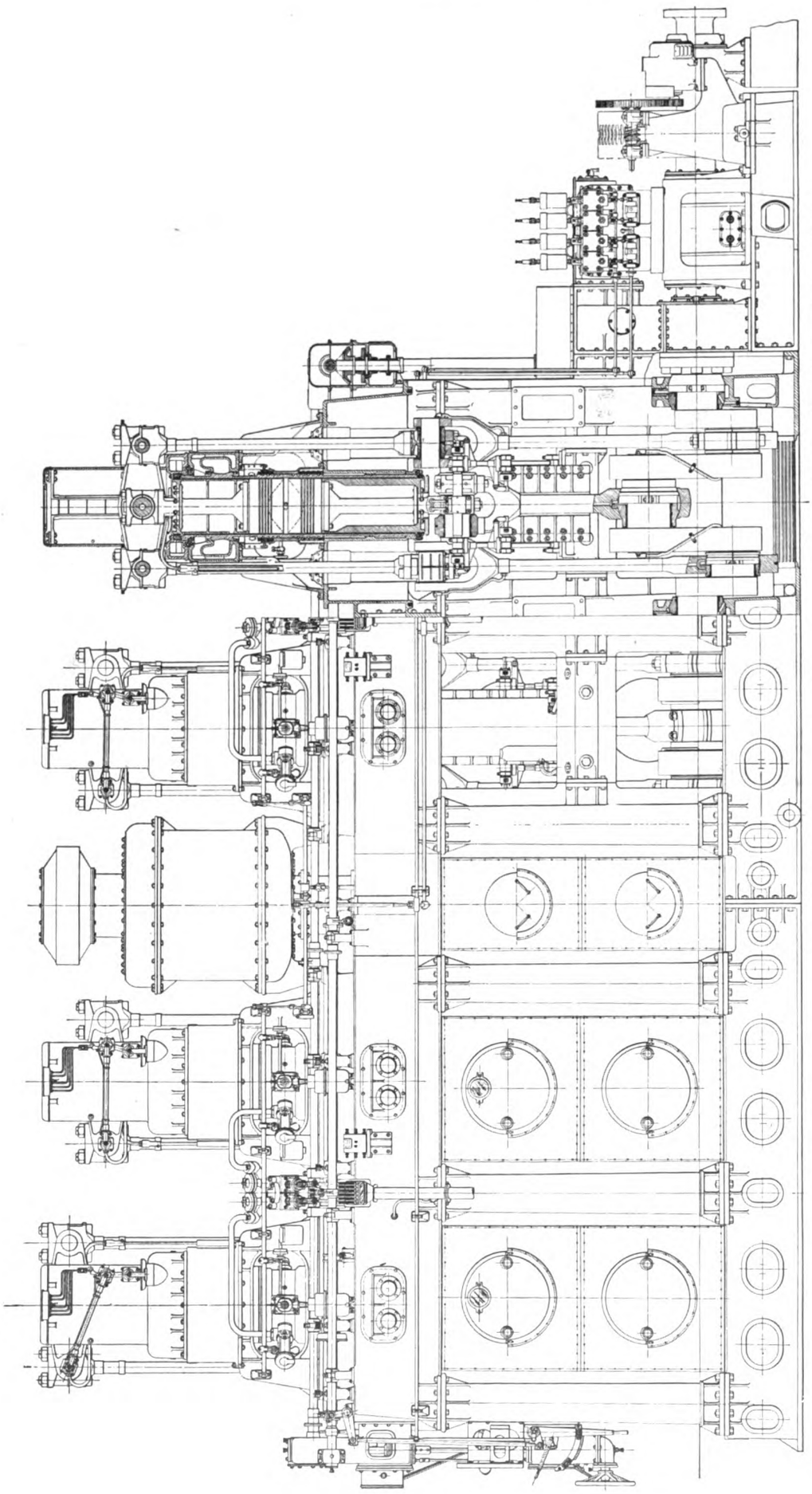

Front elevation of one of the Doxford 2,800 to 3,400 brake horsepower engines, showing longitudinal section of one of the cylinders

being for 406 passengers.

Naturally, special attention has been paid to the provision of a very large promenade space, and the A deck promenade is 422 feet 6 inches long with a height of nearly 11½ feet, while the sun promenade deck is 346 feet in length. Care has been taken to avoid fitting electric ventilating fans on the promenade decks, these being arranged on the working decks The second class accommodation is comparatively limited as may be gaged from the fact that only 75 passengers are carried, the cabins, lounge and dining saloon being located at the after end of the ship.

Ventilation is carried out on the now popular punkah louvre system, air being delivered direct to every cabin and saloon; its force, quantity and direction are capable of variation on the spot. A large Lux-Rich fire extinguishing installation is provided, a ⅛ horsepower motor being arranged to draw a sample of air from all spaces through the detecting cabinet on the bridge where the slightest trace of smoke would be noted.

Deck Equipment

As will be seen later the electric generating plant is exceptionally large and almost everything that can be driven electrically is coupled to an electric motor.

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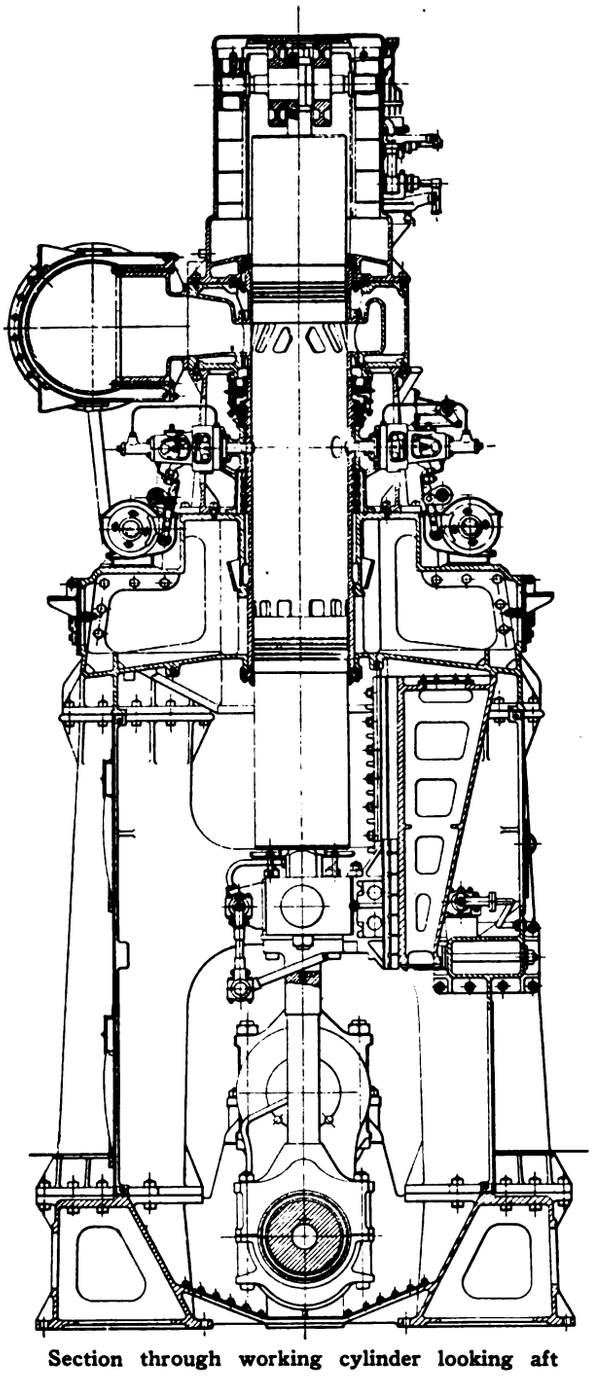
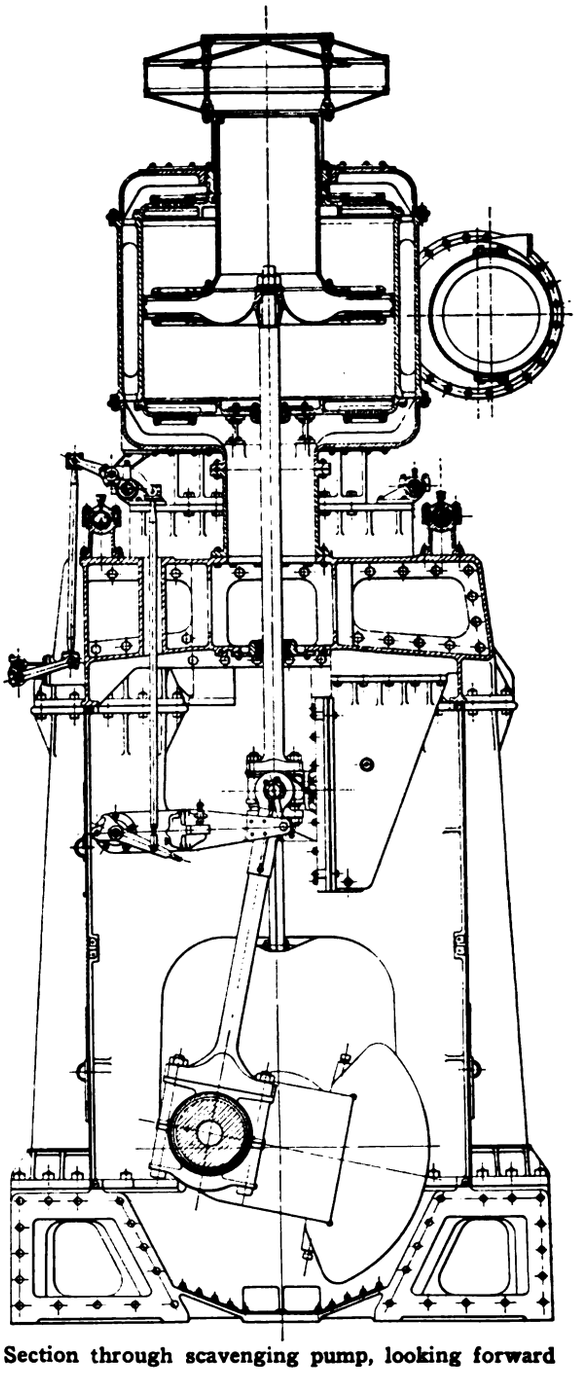
The windlass can handle a normal haul of 25½ tons at 25 feet per minute and is driven by a 125 brake horsepower electric motor, while the three warping capstans can haul 13 tons at 45 feet per minute, each being driven through worm gearing by a 65 horsepower motor. For handling the cargo (the unrefrigerated space is 84,000 cubic feet and that of refrigerated space 64,000 cubic feet) there are eight 5-ton electric winches, coupled to 48 horsepower motors, while the duplicated steering gear is of the hydro-electric design. A pneumatic despatch tube installation is something of a novelty, this being provided in order to give a rapid means of communication between the main bureau on E deck and 14 points in various parts of the ship. Solid drawn glass tubing is utilised, the air being provided by an electrically driven multi-stage turbo exhaust.



Section through working cylinder looking aft



Section through scavenging pump, looking forward

Propelling Machinery

The general machinery arrangements in this vessel are those which are now common in motor passenger liners, namely the division of the engine compartments into two separate rooms, one for the propelling engines and the other for the reception of the auxiliary machinery. In the *Bermuda*, part of the auxiliary engine room, which is forward of the main engine space, is divided aft to form a boiler room where are installed two donkey boilers mainly utilised for heating system, also for the galley and one or two other minor purposes.

The length of the main engine room is in the neighborhood of 75 feet. In it are installed the four Doxford engines, each designed for a normal output of 2,900 to 3,000 brake horsepower at from 110 to 112 revolutions per minute, thus giving the ship a speed of

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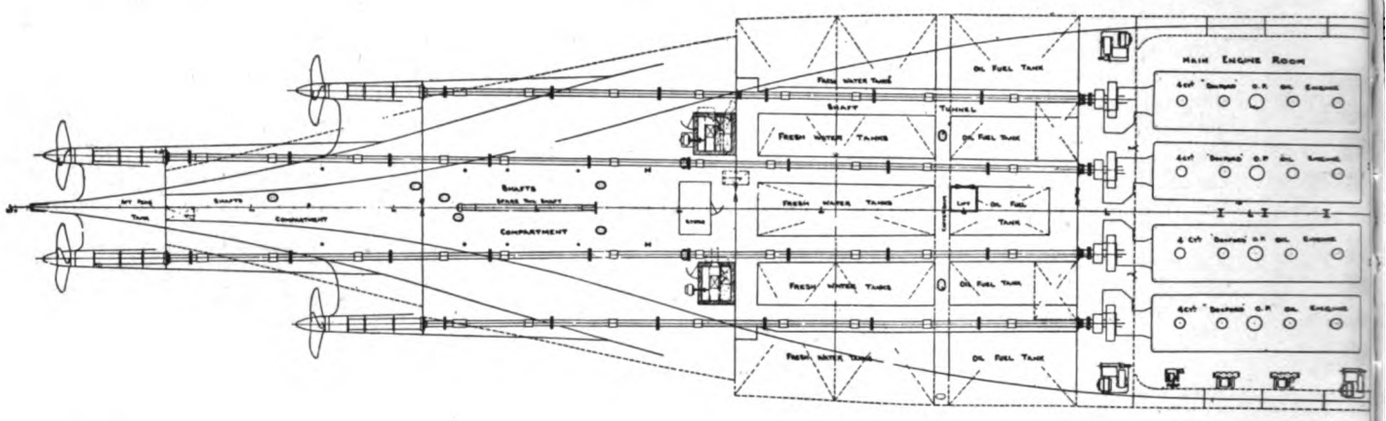


Hold plan of the Bermuda showing

17 knots. They are, however, capable of developing 3,500 brake horsepower at 125 revolutions per minute when the vessel would attain over 18 knots, and, at this output, the mean indicated pressure is about 102 pounds per square inch, which corresponds to a brake mean effective pressure of somewhat over 90 pounds per square inch. Tests showed that the fuel consumption of these engines averaged 0.385 pounds per brake horsepower hour, and at the normal output, the mean indicated pressure is 90 pounds per square inch. This consumption is somewhat lower than that of the average air injection engine and it is anticipated that the *Bermuda* will, therefore, prove an exceptionally economical ship. The daily fuel consumption for the main engines alone should not exceed 50 tons and ought to be somewhat less.

It was mentioned above that the propelling machinery represented a new type of Doxford engine. As a description of this design has already been published, it need not be repeated in detail, except to point out the salient modifications that have been made from earlier designs.

It is well known that, in the Doxford engine, there are two opposed pistons in each cylinder and hitherto it has always been arranged that these pistons have equal strokes—usually the combined stroke to bore ratio has been 4 to 1. In the *Bermuda* it was essential to reduce the height of the engines so far as possible in order not to cut in to the passenger deck too much and it was, therefore, decided to limit the stroke-bore ratio to 3 to 1.

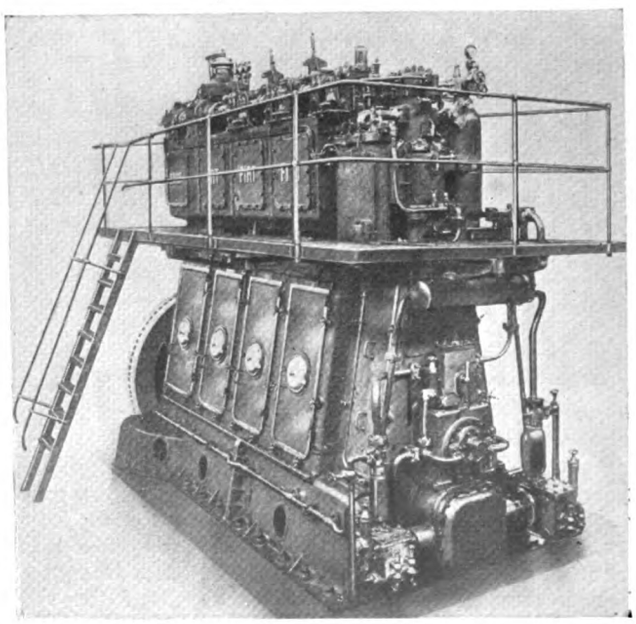
This was effected by having engines with a cylinder diameter of 600 millimeters but while the stroke of the lower piston was 1,040 millimeters that of the upper is 760 millimeters, giving a total of 1,800 millimeters. The reciprocating weights connected with the upper piston, which has long driving rods, are greater than those of the lower, but this is balanced by the shorter stroke, so that the engine is entirely balanced for vertical forces in each individual cylinder, and there are no horizontal unbalanced forces. It is claimed, therefore, that this engine is as completely free from vibration as it is possible to make a Diesel motor, and its performance has certainly been remarkably good. It should be added that each engine weighs approximately 300 tons, which may be taken as 230 pounds per brake horsepower—not an exceptionally low figure.

A new feature in the engine is the arrangement of the controls, which are all at the forward end so that the engineers can move rapidly from one unit to the other when maneuvering. Still more interesting is the application of a special brake device which enables each motor to come to rest very quickly, the saving in time being something in the neighborhood of 50 percent. It is carried out by operating a single lever, which allows air compressed in one cylinder to be delivered to another cylinder and retards the progress of the piston in that cylinder. A new type of scavenging pump is adopted with a phosphor bronze piston having ring valves, and the intake to the scavenging pump is silenced by the employment of a special material surrounding the intake reservoir.

The pump for the injection of fuel in the engine on the ordinary Doxford airless injection system is direct driven off the crank shaft, but there is an auxiliary or standby electrically operated pump for the same purpose, coupled to a 40 horsepower motor. All the other auxiliary machinery for running the main engines is electrically driven, and it may be remarked that, for the cooling of the pistons and the cylinders, distilled water is employed.

Auxiliary Machinery

It was mentioned above that the electric generating plant was on a large scale. It comprises four units,



One of the four 450 brake horsepower Fiat auxiliary engines

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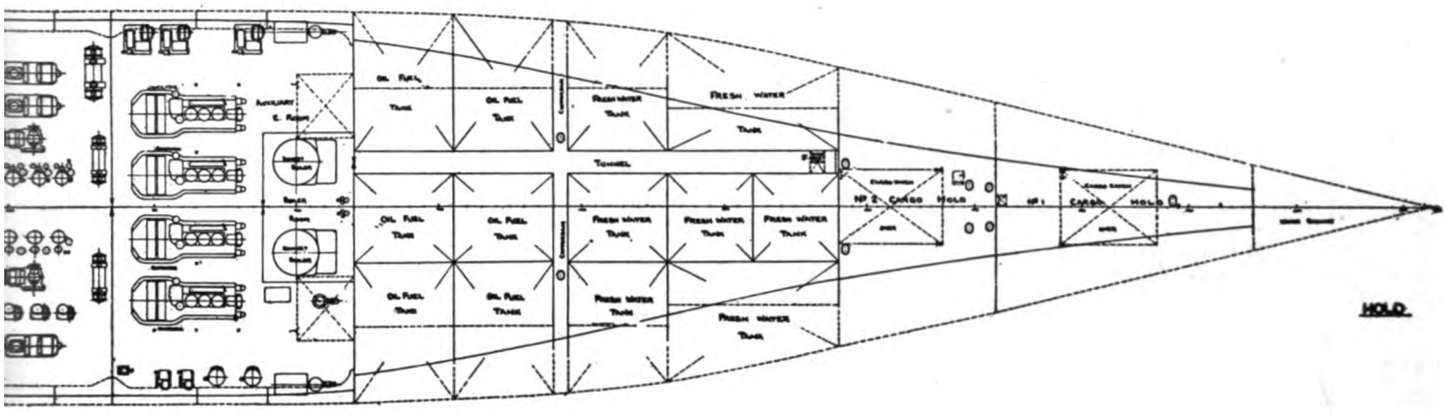

rangement of propelling and auxiliary machinery

each consisting of a three cylinder, Fiat, two stroke, single acting engine of 450 brake horsepower driving a 300-kilowatt dynamo at 250 revolutions per minute. With this plant also special attention has been paid to the question of balancing, and the results achieved are apparently satisfactory. This point must be emphasised, as there has been some discussion as to the freedom of motorships from vibration, and the builders and owners have attempted to show in the *Bermuda* that vibration is certainly not a necessary adjunct to the adoption of motor propulsion. At sea, the normal electric load will be 850 kilowatts and in case of necessity the generating plant can be overloaded up to 1,320 kilowatts.

The boilers installed are of the vertical return tube type, 17 feet in diameter and 8 feet 6 inches high, each having a heating surface of 1,000 square feet, the evaporative capacity being 6,000 pounds per hour. The working pressure is 125 pounds per square inch and it will evaporate 14 pounds of water per pound of oil.

It is unnecessary to recount the details of the auxiliary pumps, the majority of which are installed in the auxiliary engine room; some are of the vertical type with a view to reducing the space occupied. Special radiators are employed for cooling the circulating water for the main machinery, also for the lubricating oil. For the supply of starting air, three electrically driven compressors are installed, each of the three stage type, capable of delivering 240 cubic feet of free air per minute when running at 350 revolutions per minute. The motor driving each of these plants is of 105 brake horsepower and the delivery pressure of the air is 600 pounds per square inch. A separator is fitted for cleansing the bilge water and draining the tanks to prevent contamination of the sea with oil fuel.

It remains to be added that the Furness, Withy group, the owners of the *Bermuda,* have a very considerable experience with the operation of motorships so that this fine liner will be worked under the most favorable auspices and there does not appear to be much doubt of her success, both from the engineering and the operative standpoints.

Cargo of Uncrated Automobiles

THE first complete cargo of uncrated automobiles to leave the port of New York was recently shipped aboard the S. S. *Eberstein* of the Arnold Bernstein line for Hamburg, Germany. The cargo consisted solely of 550 Studebaker and Erskine automobiles, parked on the decks. The wheels were on, tires were pumped up and, with the exception of gas and oil, the cars were ready to run.

The S. S. *Eberstein* is especially equipped for the transporting of automobiles without boxing. In carrying out the loading operation, special train loads of automobiles are placed on sidings parallel to the dock. Handling is reduced to a minimum. Special crews of men push the automobiles out of the cars, across the docks and onto outboard elevators. These elevators extend over the side of the ship to the dock level.

Method of loading automobiles on vessel with outboard elevator

The cars are then pushed onto the elevators, raised to the level of the main deck where another set of 4 elevators lowers them into the hold. In the hold an electric tractor hooks onto the cars towing them into position and the loading crew lashes them down. The lashings are made fast to special steel cables running the entire length of the ship and bolted to the deck every few feet. The cars are first blocked, then lashed to the cables with rope, which prevents any possibility of movement.

On a previous trip the method of storing the cars proved entirely satisfactory. Not a car shifted position and not a claim for damage was made. It is estimated that this method of shipping cars will effect a saving of over $160 per car to the European consumer.

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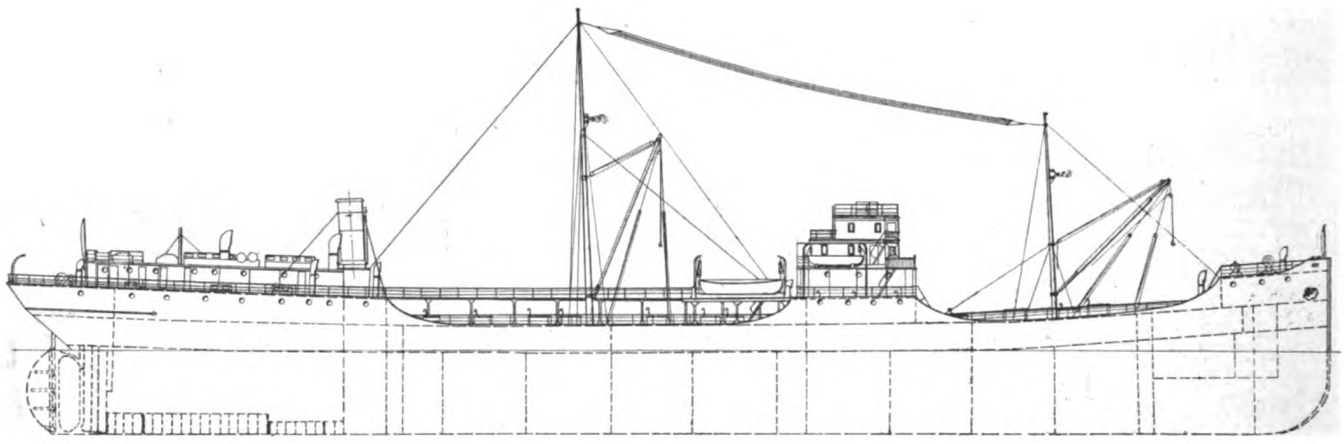

Outboard profile of converted motor tanker Caliche

M. S. Caliche Has Successful Trial

Tanker converted to Diesel propulsion at great economy has many novel features

ON January 28, 1928, the newly converted motor tanker *Caliche,* ex-*Chestnut-Hill,* held a successful trial off the New Jersey Coast during a brisk gale and a heavy snow storm. The sixty odd invited guests who braved the inclement weather, however, were well rewarded in observing the excellent conversion work carried out by the Staten Island Shipbuilding Company under the supervision of Mr. Angelo Conti, the owner's naval architect and consulting engineer. The vessel was purchased from the Shipping Board by the Anglo-Chilean Consolidated Nitrate Corporation, New York, and will be used for carrying oil between San Pedro, Calif., and Tocapilla, Chile.

The *Caliche* was originally powered with a General Electric double geared turbine rated 2,400 shaft horsepower at 90 propeller revolutions per minute, steam being furnished by two 3-furnace Scotch oil fired boilers of 5,200 square feet total heating surface, fitted with superheaters of the waste heat type and Howden forced draft. A two- furnace Scotch donkey boiler of 658 square feet heating surface, 125 pounds working pressure, operated at natural draft supplied steam for heating cargo and port uses. The power plant being considerably under-boilered, the vessel seldom averaged 9½ knots when loaded, with a consumption of about 24 tons of fuel per day. After conversion to Diesel drive the vessel had a speed of 10½ knots.

Another peculiarity of the original installation consisted in the use of alternating current to operate the deck winches, two main cargo pumps, one transfer pump, the forced draft fan and some minor auxiliaries. The generating plant consisted of two General Electric Company 3,600 revolutions per minute turbo generators, each of 100 kiloamperes 3 phase, 60 cycle, 230 volts and a small transformer to convert current to 110 volts direct current for the ship's lights.

Structural Changes

As originally arranged, the second deck immediately above the machinery space was completely plated over except for a short engine trunk and the fidley. The vessel being arranged for burning coal was fitted with longitudinal bunkers abreast of the main boilers. On the second deck, which also served as a flat for the donkey boiler at its forward end, were installed the evaporator, feed heater, traps and steam manifolds at its central portion; two turbo generators and switchboard on its starboard side and a forced draft blower, inspection tank and machine shop on the port side. The space between the fidley and the engine skylight was also occupied by the crew's mess rooms at the main deck level, and by a galley and pantry on the poop deck.

To provide a clear space sufficient for the main engine, all transverse and longitudinal bulkheads had to be removed and the engine room trunk was extended the full length of the machinery space by cutting out the second deck plating.

In order to adequately support the large concentrated weight of the main engine and to prevent any vibrations being transmitted to the hull, the ship's structure in way of the main engine was stiffened both in a vertical and transverse direction. Vertical pillars, composed of double 8-inch channels were therefore, fitted to each transverse at frames 37, 38, 39 and 40 between the tank tops and the second deck coaming. The lower ends of these pillars were connected either directly to the web frames or to deep transverse brackets extending outboard of the main engine foundations clear to the ship's sides. In addition, longitudinal brackets of generous proportions were used to connect these pillars to the tank top plating. Smaller stanchions, composed of double 6-inch channels, were also arranged in line with the lower pillars between the second and upper decks and were connected thereto with longitudinal brackets at each end. To distribute the stresses to the shell and deck plating, the resisting girder was closed by means of beams, bracketed to double stiffening angles riveted on to the engine casing.

Considerable attention was also devoted by the designer to the main and auxiliary engine foundations. As customary in steam tanker construction, the depth

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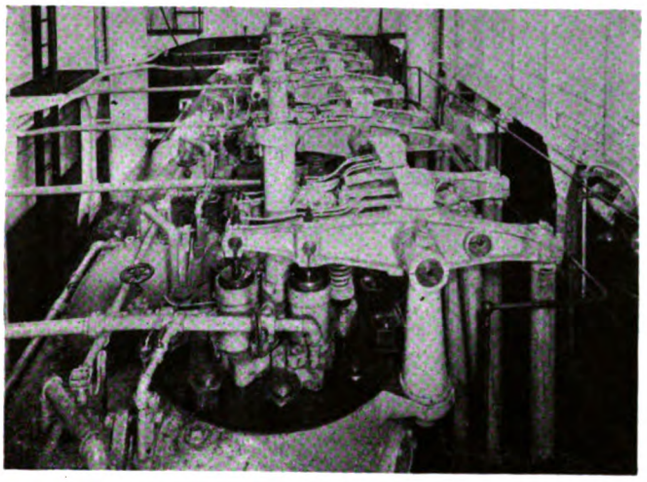
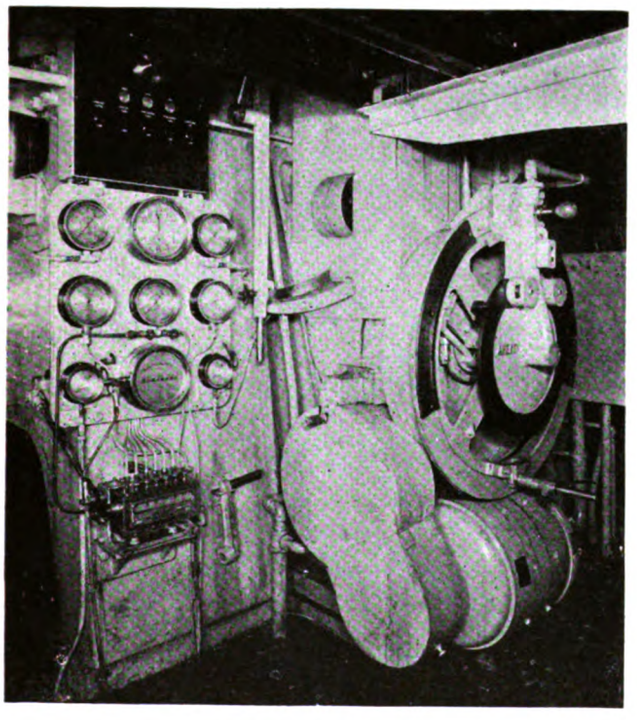
of the inner bottoms in way of the main engines is somewhat greater than in the boiler space; in the case of the M. S. *Caliche,* the inner bottom steps up at frame 38 for a depth of 12 inches. The construction adopted



Top of main engine

for the main engine foundations consists of two 7/8-inch single vertical girders, following the contour of the tank top, and a 1-inch sole plate 21 inches wide with 6 by 6 by 3/4-inch double connecting angles, the whole structure being well reinforced by numerous athwartship brackets. The horizontal webs of the lower out-



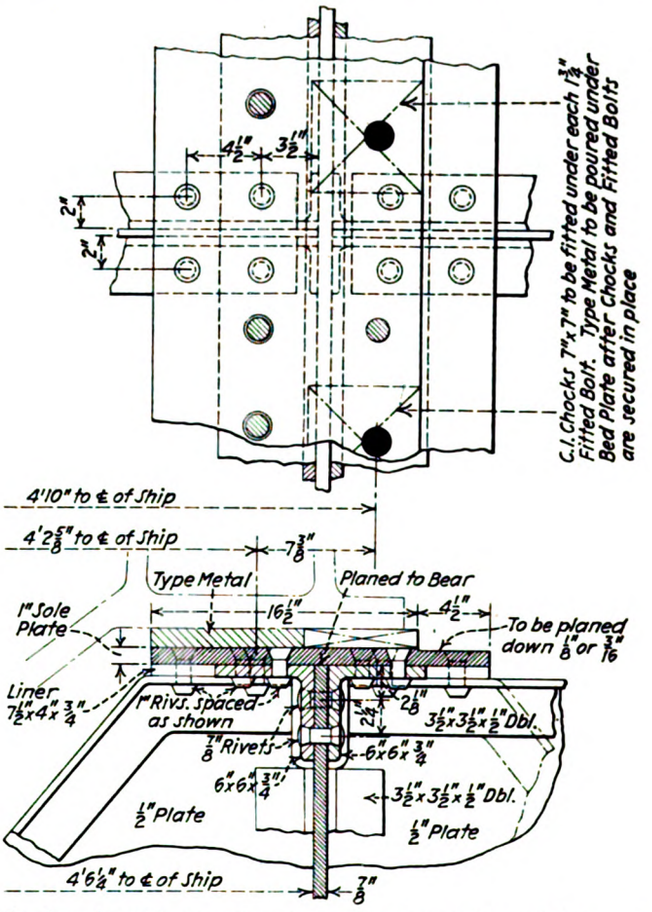
Operating station

board angles, however, were made 8 inches wide to afford a suitable connection to the tank top and to the existing inner bottom longitudinals.

Likewise, the two auxiliary Diesel generators were supported on longitudinal girders well stiffened with vertical angles and transverse brackets extending from the ship's sides to the main engine foundations.

No stiffening was required for the after inner bottom due to strong transverse construction, but, as a matter of precaution, the under side of the tank top at frames 37½ and 37¾ was reinforced by means of inter-longitudinal plates about 15 inches deep for a width of about 10 feet each side of the central line.

Another interesting and novel feature is the extensive use of type metal in conjunction with a limited number of cast iron chocks fitted to every second outboard holding-down bolt. After the engine was properly alined and secured with fitted bolts, the space between the foundation and bed plate was filled by pouring a large quantity of type metal, which has a low melting point and practically no coefficient of expansion. Approximately a hundred 1 17/32-inch holes were drilled through the bed plate, type metal and foundations for a corresponding number of 1½-inch bolts. A


C.I. Chocks 7"x7" to be fitted under each 1¾" Fitted Bolt. Type Metal to be poured under Bed Plate after Chocks and Fitted Bolts are secured in place
4'10" to ℄ of Ship
4'2⅝" to ℄ of Ship
Type Metal
Planed to Bear
1" Sole Plate
To be planed down 1/8" or 3/16"
Liner 7½"x4"x¾"
1" Rivs. spaced as shown
⅞" Rivets
6"x6"x¾"
½" Plate
½" Plate
4'6¼" to ℄ of Ship

Section through top of main engine foundation girder, port side, looking aft

similar method, but using fewer and smaller bolts, was also used for the two auxiliary generators.

This expedient, which was primarily adopted to meet special conditions and to decrease the cost, afforded a cushioning effect which has resulted in effectively deadening the noise typical of large Diesel engines. Further, the complete absence of vibration at all speeds, which was particularly noticed and favorably commented upon by all present at the trials, as well as the remarkable steadiness of the main engine and auxiliaries bespeak the soundness of the construction used.

Machinery Arrangement

With the object of reducing the cost of installation some of the original steam equipment was retained and also arranged for operation with compressed air at reduced pressure. On the other hand, all the auxil-

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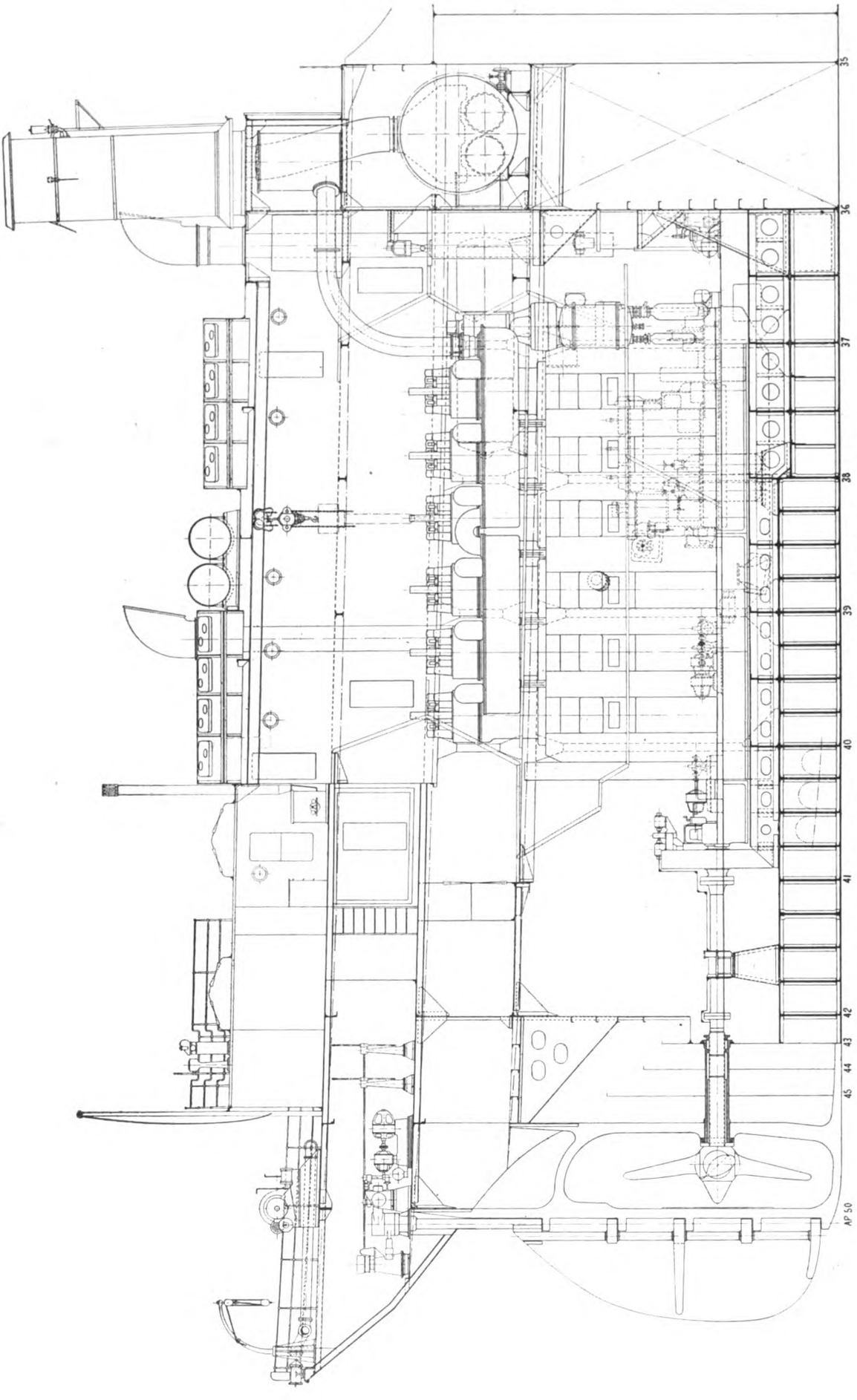

Longitudinal section through engine room of motor tanker Caliche

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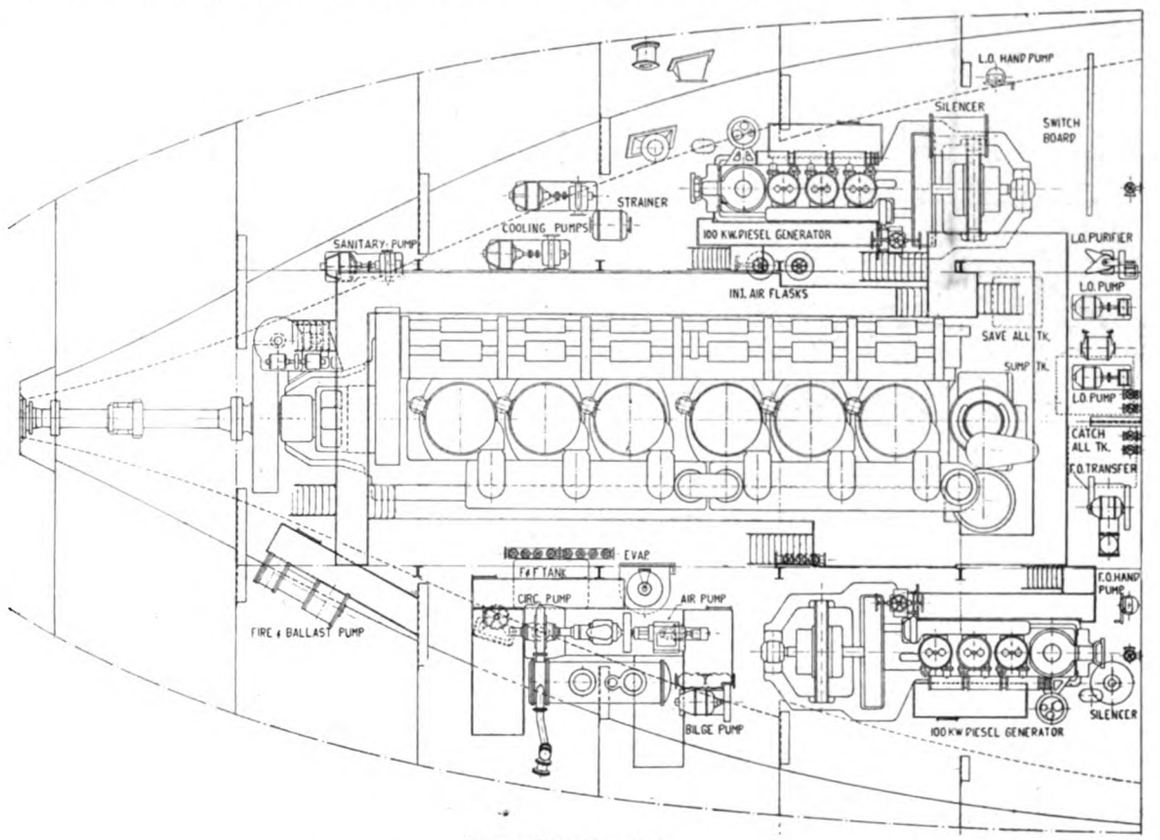
iaries that need to be continuously operated were of electric drive such as lubricating oil, salt water cooling, sanitary and bilge pumps. Likewise the Brown steam tiller was replaced with a new hydro electric steering gear, whereas the steam driven anchor windlass was retained and the original alternating current winches were replaced with Lidgerwood steam machines.

The donkey boiler was relocated on the second deck in a separate compartment, immediately forward of the engine room proper, while the auxiliary condenser with its steam driven circulating and air pump as well as the donkey boiler uptake. The old stack was reduced in 48-inch stroke, with an attached 3-stage air injection height, suitably rearranged and relocated. Likewise, to provide for the galley and mess rooms, which were eliminated in extending the engine room casing, the after end of the poop deck house was lengthened approximately 10 feet and suitably rearranged.

Propelling and Auxiliary Machinery

The main engine was furnished by the McIntosh and Seymour Corporation of Auburn, N. Y., and consists



Plan of engine room

fire and ballast pump were retained in their original location on the starboard side. The hotwell tank was reduced in size and relocated adjacent to the auxiliary condenser. The steam plant was completed with the installation of small vertical feed pump and an injector. An old pump and inspection tank were used in connection with the cargo heating coils.

For the fuel oil transfer pump, advantage was taken of an electrically driven unit which was formerly located in the forward pump room. This unit was transferred to the engine room and one of the available steam pumps of the same make and size was substituted in the forward pump room with no change in either foundation or piping.

With the exception of the machine shop on the port flat, and the steam equipment already referred to, everything else was removed from the engine room including main and auxiliary machinery, boilers, manifolds, piping, etc.

In working out the new arrangement, a considerable portion of the old material such as manifolds, valves, floor plates, ladders and gratings was again utilized.

Other changes incidental to the new propelling power were the extension of the forward end of the poop house, to provide an enclosure for the main muffller and of a 4-cycle, single acting, 6-cylinder unit, 29-inch bore, 48-inch stroke, with an attached 3-stage air injection compressor at its forward end. This unit was originally built in the summer of 1922 with 28-inch cylinders and was rated 1,800 shaft horsepower at 120 revolutions per minute. As the hull's natural period of vibration was calculated to be around 115 vibrations per minute with the ship fully loaded, it was decided to reduce the full power revolutions to 105 per minute.

To compensate for the corresponding loss in power, without unduly increasing the mean indicated pressure, it was decided to replace the original liners and pistons with new ones of 29-inch bore as the simplest and cheapest solution. This was done in view of the fact that the crank shaft was larger than required by the classification societies, and the original bearing pressures were also quite moderate.

This engine is the first marine unit built by McIntosh and Seymour and may be considered as the prototype of the larger engines built for the Shipping Board, the similarity of design being quite apparent. The main frames are of strong "A" box construction with a division plate beneath the main cylinders. The telescopic pipes for the piston cooling system rest on this plate and are packed from the outside, thus preventing any entrance of salt water to the crank case.

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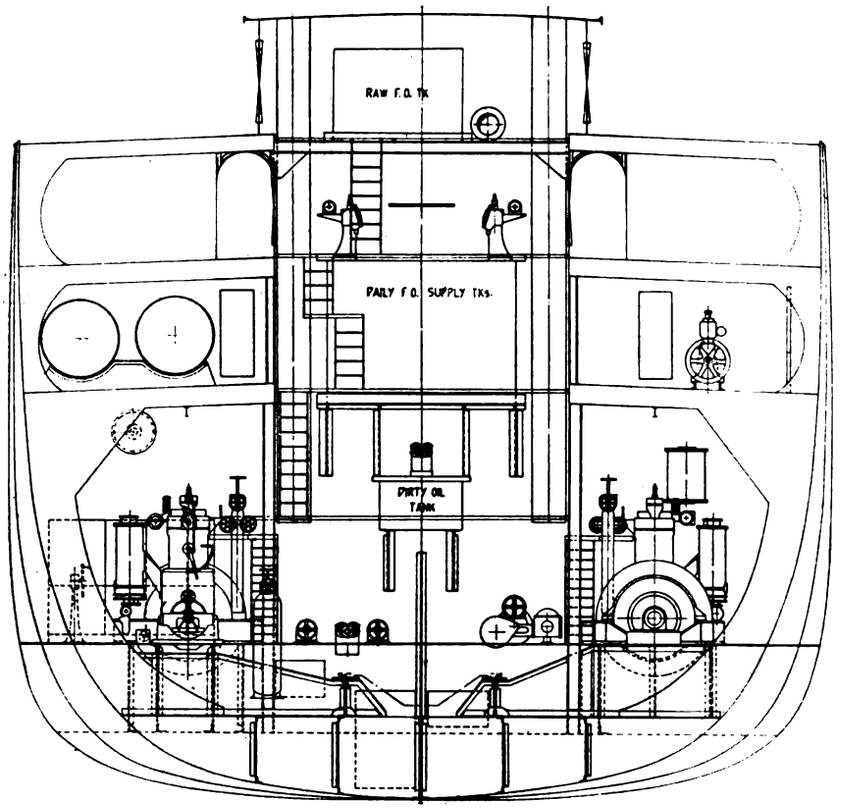
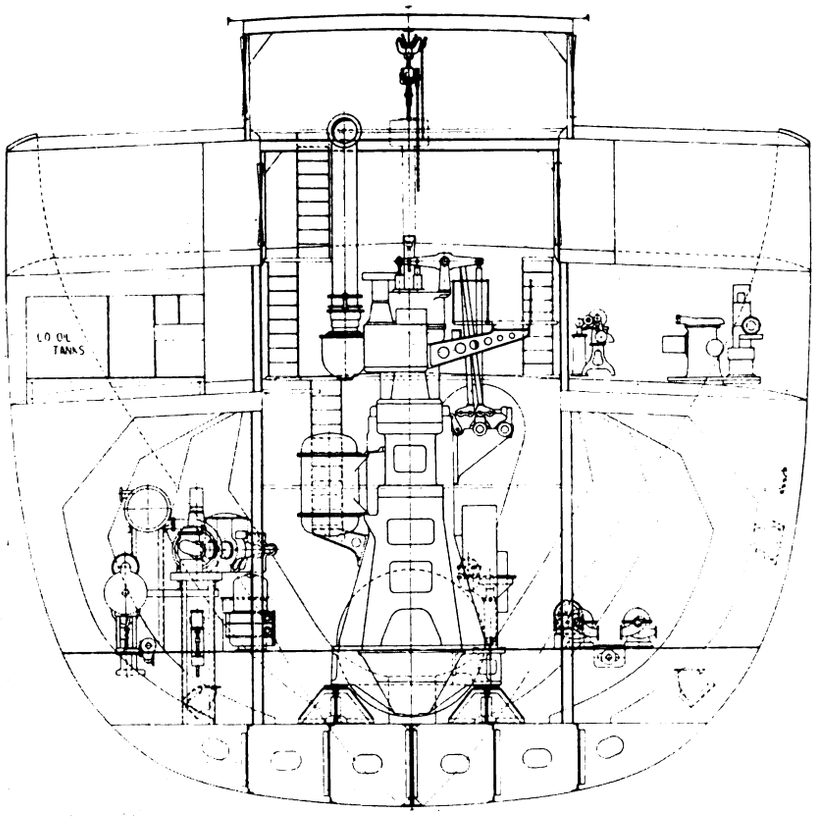


Section through engine room, looking forward



Section through engine room, looking aft

Propelling and Auxiliary Machinery

PROPELLING MACHINERY

1 main Diesel engine, McIntosh & Seymour, 1,800 shaft horsepower
1 3-stage compressor attached to main engine
2 starting air tanks, 350 cubic feet capacity
2 injection air tanks, 17 cubic feet capacity

AUXILIARY DIESEL ENGINES

2 compressor-generator units driven by McIntosh & Seymour 150 horsepower Diesel engines; 3-stage oversize compressor and Ridgeway 100-kilowatt generator
1 emergency compressor - generator unit driven by Hill Diesel engine; 3-stage Rex emergency compressor and General Electric 8-kilowatt generator

MOTOR DRIVEN AUXILIARIES

1 National Transit horizontal duplex fuel oil transfer pump, 5¾ inches by 6 inches
2 Schutte & Koerting gear-driven lubricating oil pumps, 100 gallons per minute
2 Worthington centrifugal salt water cooling pumps, 700 gallons per minute
1 Worthington centrifugal sanitary pump, 200 gallons per minute
1 Bethlehem-Weir vertical duplex bilge pumps 8 inches by 7½ inches
1 Sharples open type lubricating oil centrifuge, 200 gallons per hour
2 Sharples fuel oil centrifuges 200 gallons per hour
2 Frank A. Holby Corporation combined blower and gear type fuel oil pumps for donkey boiler

STEAM PLANT

1 Scotch marine 2-furnace donkey boiler, 125 pounds per square inch pressure
1 Bethlehem-Weir vertical simplex feed pump, 6 inches by 4 inches by 7 inches
1 Consolidated Ashcroft-Hancock Company Injector
1 C. H. Wheeler Company 2-pass cylindrical auxiliary condenser
1 C. H. Wheeler Company combined Rotex air pump and 5-inch single suction centrifugal circulating pump, driven by 6½-inch by 6-inch vertical single cylinder steam engine
1 National Transit horizontal duplex fire and ballast pump, 10 inches by 8½ inches by 10 inches
1 National Transit horizontal duplex vacuum pump, 6 inches by 6 inches by 6 inches
1 National Transit horizontal duplex fresh water pump, 5¾ inches by 4¾ inches by 5 inches
1 Schutte & Koerting 20-ton, vertical Navy type evaporator

DECK MACHINERY

1 American Engineering Company electric hydraulic steering gear
1 American Engineering Company windlass, 9-inch by 9-inch steam cylinders
1 Lidgerwood Manufacturing Company mooring winch, 8¼ inches by 8 inches, double geared
2 Linderwood Manufacturing Company cargo winches, 8¼ inches by 8 inches, single geared
1 Brunswick ice machine, 2-ton capacity

MISCELLANEOUS PUMPS

1 National Transit horizontal duplex transfer pump, 6 inches by 6 inches by 6 inches
1 National Transit horizontal duplex bilge pump, 6 inches by 5¾ inches by 6 inches
2 National Transit horizontal duplex cargo pumps, 10 inches by 12 inches
1 National Transit horizontal duplex bilge pump, 6 inches by 5¾ inches by 6 inches

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The returns from guides and pistons discharge into open troughs back of the engine and collect into a common main which is led to the forward bilge well. The returns from the cylinder jackets and heads are grouped into a separate system, led to a collector box with visible outlets placed fairly high on the starboard engine casing, and then overboard through a common pipe.

Lubricating oil for the main engine is furnished by two independent electrically driven Schutte and Koerting herringbone gear pumps placed near the forward bulkhead. The crank case is drained through a system of double external pipes leading to a large sump tank which projects through the forward bilge well in order to secure good drainage. All other bearings such as cam shaft, push rods and rocker arms are hand lubricated while the main and compressor cylinders are served by Bowser forced feed lubricators.

A feature not embodied in the Shipping Board conversions is the thrust shaft and bearing which are housed in a strong casting bolted directly to the bed plate. Such construction obviates any weaving of the thrust block, as was experienced in some recent conversions. The foundation design is made simpler and less costly as the thrust bearing can be supported on an extension of the main girders thus enhancing that rigidity of construction so essential in large direct connected Diesels.

The engine is controlled by an electrically operated gear, actuated by a 15 horsepower, 230 revolutions per minute General Electric motor, which automatically performs all starting, stopping and reversing operations and is fitted with mechanical interlocks controlling the fuel, injection and starting air. There is also fitted a Marshall gear which controls the fuel valve opening. The long handle, which can be seen immediately to the right of the gage board, rotates the fuel shaft and adjusts the position of the rollers relative to the nose of the fuel cams, so that the lift and the point of closing of the valve needles best suit the speed of the engine at the moment. This electric maneuvering gear is built as a self-contained unit, mounted on the compressor frame at the cam shaft side. It can also be operated with a hand crank in the event of derangement of the electric motor.

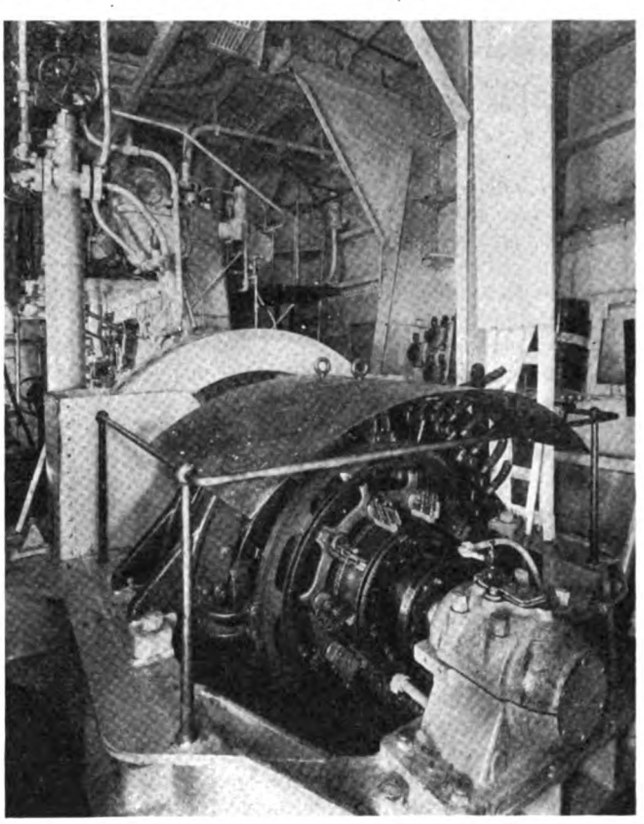
The compressed air for starting and maneuvering is stored in two cylindrical tanks located on the port flat. They have a capacity of 350 cubic feet each, built for a pressure of 400 pounds which can be replenished either by the the surplus capacity of the main compressor or by the oversize compressors attached to the auxiliary Diesels. There are also one main and one reserve injection flask each of 17 cubic feet capacity, placed contiguous to the operating platform; and a complete system of seamless drawn steel piping, forged steel manifolds and valves is necessary for satisfactory operation.

The two auxiliary Diesels were also furnished by McIntosh and Seymour and consist of 3 cylinder, 13-inch bore, 18-inch stroke, 4 cycle, single acting, 150 brake horsepower, 265 revolutions per minute units of the trunk piston type. A 3-stage compressor, with an excess capacity of 165 cubic feet of free air per minute over and above the injection air needed for the full power operation of each unit, is directly attached to one end. The flywheel end drives a 100-kilowatt, 3-wire, 240 to 120-volt, direct current Ridgeway generator. The cylinder cranks are spaced 120 degrees apart. In order to secure the best vertical and horizontal balance, the compressor crank was set 30 degrees behind No. 3 cylinder and balanced with a counterweight. This arrangement, together with the robust foundations provided, has resulted in a well-balanced unit remarkably free from vibrations.

Electrical Plant

In addition to the 2 main generators already described, a 13 brake horsepower, 550 revolutions per minute 2 cylinder Hill Diesel engine drives an 8-kilowatt, 120 volt, direct current marine type General Electric generator and a R-x 3-stage emergency compressor, having a capacity of 12 cubic feet of free air per minute and suitable for 1,000 pounds pressure. This unit, together with its auxiliary panel, is located above the waterline on the forward starboard flat and is intended for emergency and port uses.

The generating plant is connected to a marine type switchboard consisting of 2 generator panels, with instruments and 5-pole circuit breakers, one 230-volt



Generator set

power panel, three sub-panels containing the motor controls, and one 115-volt lighting panel. The main generators are bussed for parallel operation on the 3-wire system, but their circuit breakers are so interlocked with the emergency generator circuit breaker that this is positively locked in an open position and can be closed only when the main generator circuit breakers are both open, and vice versa. The emergency generator, however, is connected through its own panel to the 115-volt lighting panel of the main switchboard. When in operation both of the main generator circuit breakers are automatically locked in an open position thus preventing any intermingling of current between the two systems. In this way, besides utilizing the original wiring and light distribution panels, the usual motor-generator was dispensed with, thus effecting a material saving and considerable simplification.

All motors, controlling equipment and switchboard were furnished by the Westinghouse Electric and

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Manufacturing Company, East Pittsburgh, Pa. The motors with the exception of the main cargo pump motors are of the semi-enclosed or drip-proof SK marine type, 40 degrees centrigrade continuous rating, fitted with ball bearings. The main cargo pump motors are watertight, externally ventilated, and fitted with bearings of the sealed sleeve type. All motors are arranged to operate on 230 volts, excepting the donkey boiler blower and fuel oil units, which are connected to the 115-volt circuit so as to operate also from the emergency generator.

Motors

The control apparatus for the following motors is mounted on the main switchboard and consists of accelerating contractors and overload relay with automatic resetting and low voltage releases.

2—Circulating pump motors, 20 horsepower constant speed, 1,750 revolutions per minute.

1—Sanitary pump motor, 10 horsepower, constant speed, 1,750 revolutions per minute.

2—Lubricating oil pump motors, 5 horsepower, variable speed, 1,750 to 1,150 revolutions per minute.

1—Fuel oil transfer pump motor, 5 horsepower, variable speed, 1,350 to 800 revolutions per minute.

2—Cargo pump motors, 70 horsepower, variable speed—1,500 to 900 revolutions per minute.

1—Cargo pump ventilating motor, 1½ horsepower, constant speed, 1,180 revolutions per minute.

Watertight push button starters are mounted on these motors with a cut-out line switch at the board excepting the cargo pump motors which are protected by a 300 ampere circuit breaker. As previously noted, the cargo pump motors are externally ventilated by a Sturtevant blower of 2,500 cubic feet per minute against 2-ounce pressures which together with a gage board, relay panel and an additional set of push button starters, are located in a separate control room in the amidship superstructure. The control apparatus of these pumps is so designed that their motors cannot be started until the ventilating fan is first operated for a period of at least two minutes by means of a time relay.

The remaining motors that are further removed from the switchboard, were arranged for manual control, providing overload protection with automatic reset and low voltage release, all enclosed in drip-proof cabinets. Motors thus provided for are as follows:

1—Engine bilge, pump motor, 10 horsepower, variable speed, 900 to 600 revolutions per minute.

1—Workshop motor, 5 horsepower, variable speed, 1,750 to 1,150 revolutions per minute.

2—Donkey boiler motors, 1½ horsepower, constant speed, 3,450 revolutions per minute.

2—Fuel oil separators, 1½ horsepower, constant speed, 3,450 revolutions per minute.

1—Lubricating oil purifier, 1½ horsepower, constant speed, 3,450 revolutions per minute.

1—Ice machine motor, 5 horsepower, variable speed, 1,750 to 1,150 revolutions per minute.

1—Steering gear motor, 12 horsepower, constant speed, 800 revolutions per minute.

Lights

Cargo reflectors are fitted on both masts and at the after end of the poop deck house for the stern discharge station, as the vessel will be riding at anchor in an open roadstead when unloading in Tocapilla. The various levels of the engine room are also well lighted by numerous lamps and powerful reflectors.

The power cables and wiring are carefully laid out in a neat and unobtrusive manner and well supported in U-shaped channels of perforated sheet steel; the switchboard assembly presents a particularly compact and pleasing appearance and the whole electrical installation bears evidence of thoughtful conception and careful execution.

Hull Improvements

While we are naturally more concerned with the engineering features of this conversion, we were also impressed with the character of the improvements effected throughout the hull. Some of these improvements were necessary to fit the vessel for the particular trade while others were a matter of comfort or convenience.

The cargo deck lines, which formerly terminated amidship, were somewhat rearranged and a new 10-inch main was extended to the stern and fitted with two 8-inch branches. A 2-ton davit, with fair leads to the mooring winch, was also provided for handling the discharge hose.

In rearranging the after quarters for the smaller crew required as a motorship, a large and comfortable room on the forward port side of the poop was outfitted for three passengers. The M. S. *Caliche* affords the only direct transportation between California and the Anglo Chilean's properties and may often carry some of the company's employees. A spare room contiguous to the captain's bath, was also outfitted for owner's use.

A new wheel house was built on the flying bridge. The lower steering station was eliminated and this space was merged with the original captain's office and transformed into a pleasant combination lounge and owner's dining room.

The original Brown steam tiller, which was controlled by shafting from the bridge, was replaced by an American Engineering Company's steerer with opposed 9 inch hydraulic rams and a Hele-Shaw motor driven pump with telemotor control.

Also, to better fit the vessel for tropical service, the original steel awning deck on the poop was replaced with canvas and a new docking bridge was built at the after end. The steering stand and telegraphs taken from the lower station were rearranged for emergency steering, directly connected to the follow-up mechanism of the new hydraulic gear so that with the original hand gear, three different means of steering are now provided.

The vessel was also thoroughly overhauled and presented a decidedly smart appearance and with the additional improvements and comforts provided, she now favorably compares with more modern vessels of the same type and size.

We were particularly impressed with the roomy and simple arrangement of machinery which well provides for accessibility and inspection with a generally pleasant appearance and refinement of details. We understand that the work properly chargeable to Diesel conversion totalled approximately $380,000, which is most reasonable for such a high-grade installation. We, therefore, congratulate Mr. Conti for such a creditable and thrifty installation, as well as the Staten Island Shipbuilding Company for the workmanlike manner with which it has been carried out.

PULVERIZED COAL EQUIPMENT ORDERED.—The Peabody Engineering Corporation, New York, has received an order for powdered coal burners and other equipment to be installed by the Halifax Shipyards, Ltd., Halifax, N. S., on the Dominion Coal Company's steamship *Lingan*. The work is being directed by the owners' naval architect, Mr. E. C. Bennett of New York. Kennedy pulverizers are to be used.

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A New Winton Diesel Marine Engine

Details of new type airless injection engine developed by the Winton Engine Company

THE Winton Engine Company, of Cleveland, O., has recently announced the introduction of a line of airless injection Winton Diesel marine engines, ranging from 50 to 1,500 horsepower.

This new type Winton engine is a distinct departure in design. It is a four cycle engine, with decided refinements and improvements over the conventional type. It produces maximum power for a given cylinder displacement, and the various units are compact with an unusual combination of light weight and rugged strength. They are characterized also by minimum number of parts, precise balance, low operating cost and quiet, smooth performance.

One of these new engines, the 200 horsepower, six cylinder model, was displayed at the 1928 New York Motor Boat Show, where it was very favorably received.

All control levers, as well as the instrument board with gages, are conveniently located at the front end of the engine. All working parts are readily accessible, and are lubricated by pressure feed.

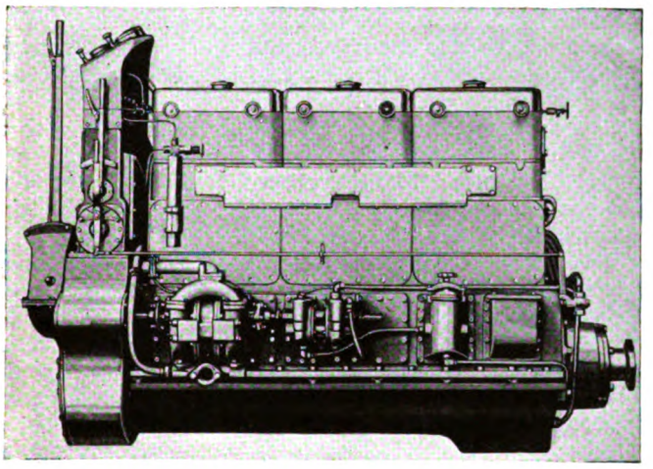
Fuel is fed directly from the main fuel tank through a three-cylinder plunger type pump into the fuel manifold and from there is injected under pressure into the cylinders, through a special needle type injection valve, which is operated by the cam shaft. The fuel is ignited by the heat of compression only.

The fuel consumption is said to be low, and the power output per gallon of fuel correspondingly high. Throttling down is accomplished by reducing the pressure on the fuel oil.

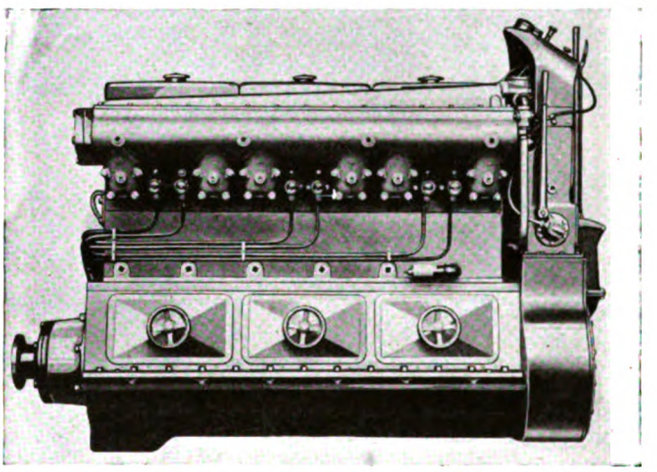
The cylinder block is a one piece chrome nickel iron casting, which carries the cylinder liners. These liners are easily removed. Dual valves are in the cylinder head, and are enclosed by oil-tight covers.

Reversible, gear type water and lubricating pumps are located on the side of engine. A Winton air starter, operating on 400 pounds of air, is used.

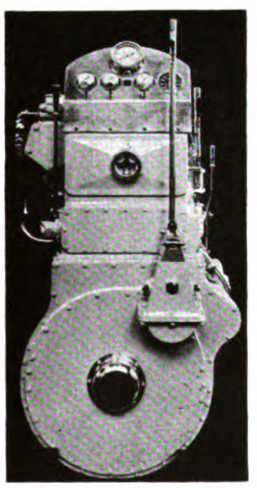
The crank shaft is made of chrome nickel steel, and is 4½ inches in diameter. It is seated in seven main bearings which are cast integral with the bottom crankcase, which is a rugged semi-steel casting.

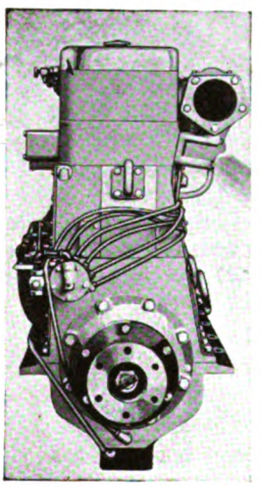


Front view of engine

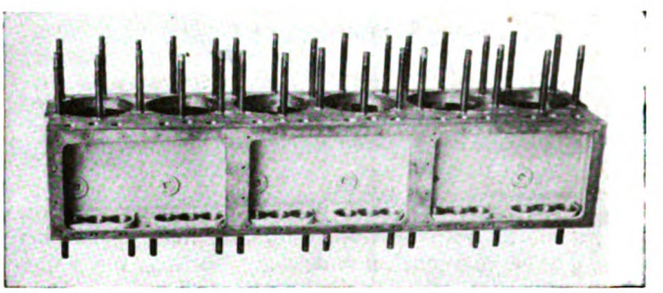


Back view of engine

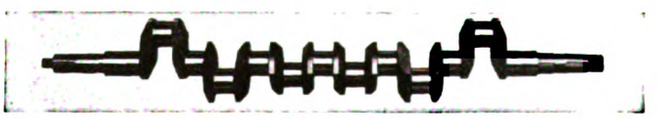




End views of engine



Cylinder block



Crank shaft

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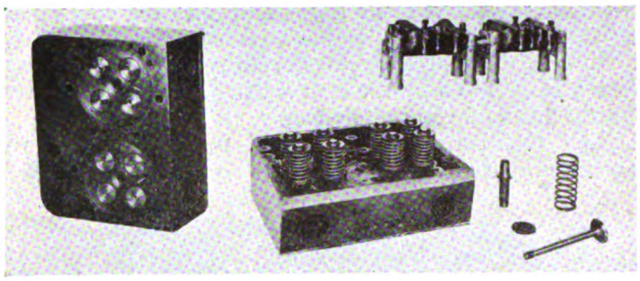
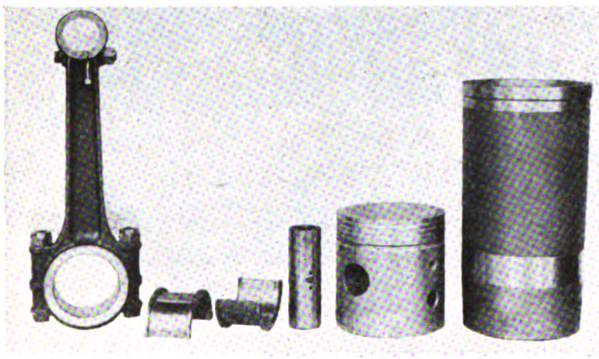
The cylinder heads are easily removed, without removing the intake or exhaust manifolds, and are fitted with removable aluminum covers.

The cam shaft, of the built-up type, is carried in seven bearings in the top crank case. The cams are



Cylinder head and valves



Connecting rod, piston and cylinder liner

of molybdenum steel drop forged and hardened. The cam shaft, fuel pump, oil pump and water pump are driven by spiral gears off the front end of the crank shaft.

All models are supplied in port and starboard rotation; also for both medium duty and high speed service. The equipment includes air bottles, instrument board and gages, service fuel pump and a set of tools. The weight of model 138, the six-cylinder unit developing 200 horsepower at 700 revolutions per minute, is 7,400 pounds.

Great Lakes Bulk Cargo Records Broken

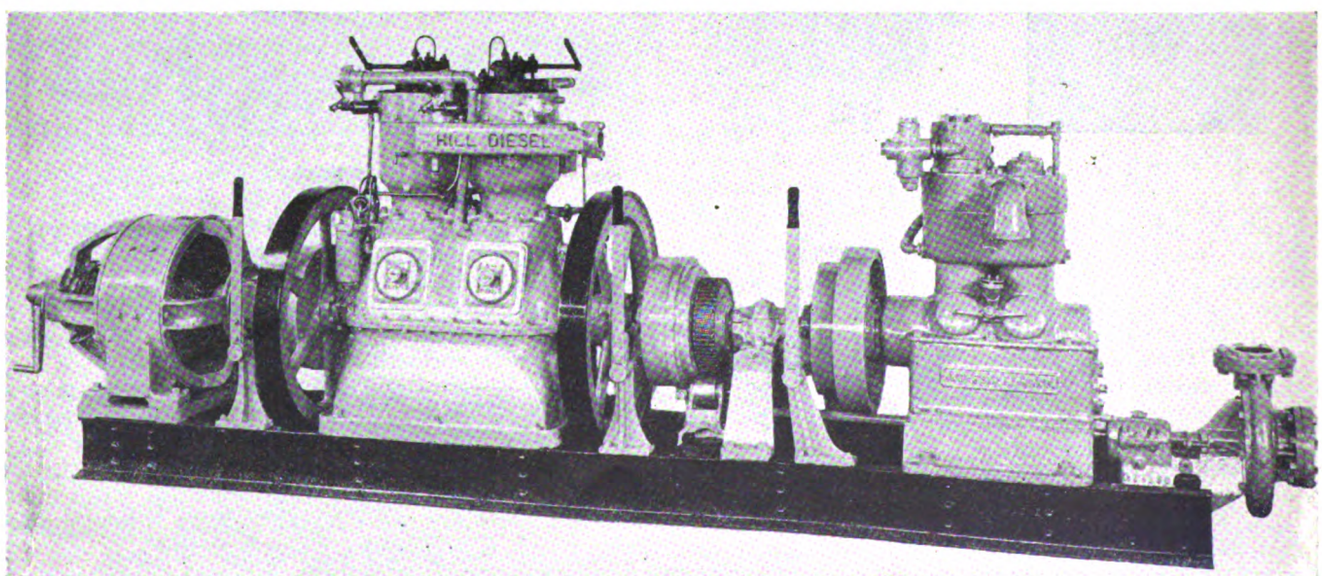
THREE all-time bulk cargo records were established during the past shipping season on the Great Lakes. Two of these, ore and rye were of Canadian registry, while the third, limestone, was carried by a vessel of United States registry. The *Donnacona* carried the largest cargo of ore so far made on the Great Lakes when she carried 14,532 gross tons, equal to 16,275 net tons.

The steamer *Lemoyne* carried off the honors with a cargo of rye amounting to 538,817 bushels, or 15,087 net tons. The next highest record was made by the *Colonel James M. Schoonmaker* in 1922 when she had aboard 513,000 bushels, or 14,364 net tons of rye.

Two vessels during the past year carried larger limestone cargoes than the next previous mark made in 1918. The steamer *L. E. Block* had a cargo of 15,622 gross tons during 1927, and then this record was beaten by the *Carl D. Bradley*, which carried 15,724 gross tons. The previous record was made by the *D. G. Kerr* in 1918, when she transported 14,084 gross tons.

Auxiliary Unit for New York State Dredge

THE Hill Diesel Engine Company of Lansing, Mich., is installing an auxiliary unit on the New York State Barge Canal dredge, recently rebuilt at Syracuse, N. Y. The unit includes a 2 cylinder Hill Diesel engine with 4⅜-inch bore and 8-inch stroke, an 8-kilowatt General Electric generator, an Ingersoll-Rand type 20 compressor, a Gould pump, twin disk friction clutches and a Whitney silent chain drive.



Hill Diesel engine auxiliary unit for New York dredge

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Hamburg-South American Line's motor liner Monte Cervantes

New European Motor Liners

Large Diesel engined vessels for Dutch and German owners — A geared motor vessel

By Our London Correspondent

IT IS well known in shipping circles that a large amount of passenger liner tonnage has to be ordered by British and Continental shipowners in the near future, and one of the reasons why there is so much delay is that with the marine engineering position in its present state of flux owners responsible for the expenditure of anything between £1,000,000 and £5,000,000 on new ships wish to assure themselves that they are making the right choice in regard to propelling machinery, and will not find, after the orders have been placed, that it would have been more economical to adopt another system.

The claims of the internal combustion engine, the high pressure steam turbine and the Bauer-Wach system are, therefore, in each case being carefully analysed; but, on the whole, it cannot be denied that the Diesel motor is gaining ground. Orders were placed at the end of January for four 18-knot passenger liners of 19,000 tons gross, two for the Netherland Steamship Company, and two for the Rotterdam Lloyd, all to have Sulzer twin screw machinery of 14,000 brake horsepower. The Scandinavian American Line, the Swedish American line and the Norwegian American Line all intend to build passenger ships of between 18,000 tons and 20,000 tons gross to operate between Copenhagen, Stockholm, Bergen and New York respectively, and it has been definitely decided that the first two vessels shall be Diesel engined.

Several other owners in England, France and Italy have new liner tonnage in contemplation. Consequently, the recent completion of three important motor liners has attracted a good deal of attention and on the trials representatives of many big shipping companies were present with a view to ascertaining the performance of oil-engine drive on big ships of this class.

The Monte Cervantes

Although the smallest of the three liners in question, the *Monte Cervantes*, built by Blohm & Voss for the Hamburg-South American Line, is in some respects the most interesting, in view of the adoption of geared Diesel machinery.

Most of the new liners which have lately been built for passenger service to South America have been of the luxury class, including, for instance, the 32,000-ton motor liner *Augustus*, the 24,000-ton *Saturnia*, the two 22,000-ton motor liners for the Royal Mail Steam Packet Company, and the turbine ship *Cap Arcona*.

The *Monte Cervantes* is of quite another type, which the Hamburg-South American Line has evidently found very satisfactory, although its adoption in the first place was considered to show a certain degree of temerity on the part of the owners. She is a one-class vessel of 14¼ knots speed, against the 17 to 19 knots of the liners mentioned above. For a vessel of 14,000 tons gross, the accommodation is on an enormous scale, for no fewer than 2,492 passengers can be carried.

It remains to be remarked, however, that of these only 1,230 are provided with cabins of the four and six berth type, while the others, totalling 1,262, have to content themselves with open berths. Incidentally, for such accommodation, the passenger traveling from Hamburg to South American ports pays only about £12.10.0. The accommodation is such that all the cabins are on decks "A", "B" and "E", while the open berths are provided on deck "F". The public rooms, while without any indication of luxury, are quite comfortable, and the same may be said for the cabins which all have running water, besides effective heating and satisfactory ventilation.

The main particulars of the *Monte Cervantes* are as follow:

Length between perpendiculars	497 feet
Molded beam	65.5 feet
Maximum draft	26.6 feet
Gross tonnage	14,000
Deadweight capacity	8,600 tons
Service speed	14¼ knots

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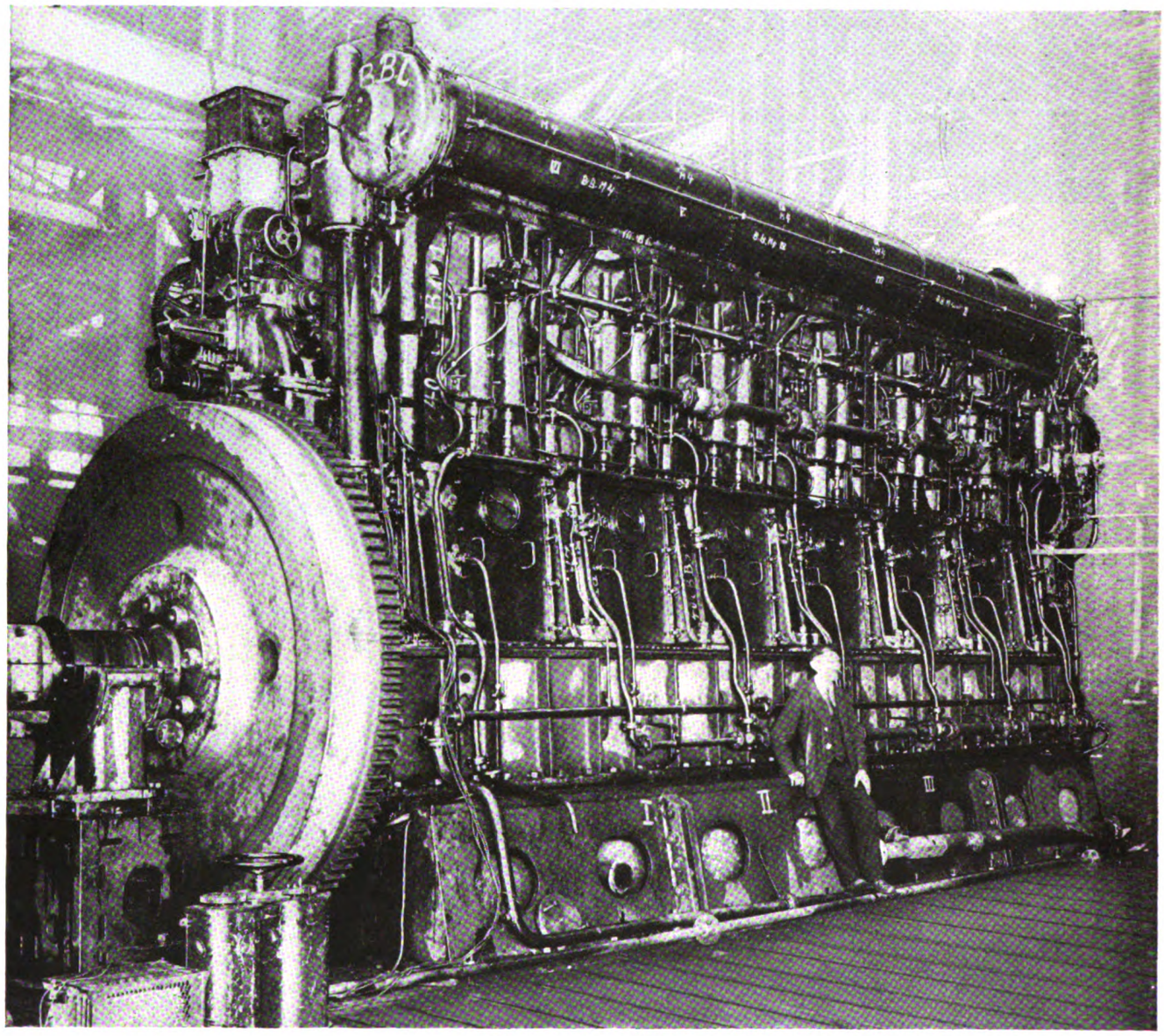
Geared Diesel Engines

The Hamburg-Amerika Line and the Hamburg-South American Line are the only two European shipowning concerns with experience of geared Diesel engines, as no other owners will apparently take this system into consideration. Yet the two firms mentioned continue to adopt it, which would seem to imply that it has proved satisfactory in service. No doubt if the two 17-knot Hamburg-New York liners which the H. A. L. are building, and in which double acting geared machinery is fitted, prove successful, other owners may go more closely into the undoubted advantages in the matter of weight and space reduction conferred by the employment of high speed motors in conjunction with reduction gearing.

In the *Monte Cervantes* are four engines of the four cycle, single acting design, all running at 210 revolutions per minute; each pair is geared to a single propeller shaft operating at 75 revolutions per minute in normal circumstances. These engines are six cylinder, crosshead type M.A.N. units with cylinders 630 millimeters bore and a piston stroke of 700 millimeters. Each has an output of 1,500 brake horsepower giving a total of 6,000 brake horsepower and they are unsupercharged.

Steam and Electric Auxiliaries

The auxiliary machinery calls for some notice, as it represents a combination of steam and electric drive. The winches, for instance, are steam driven and a number of the pumps, but in order that this may not involve uneconomical operation at sea, the exhaust gases from the propelling engines are led through boilers which supply the necessary steam. Naturally, when the vessel is in port and the winches are in service, oil-fired boilers must be brought into operation.



One of the four 1,500 brake horsepower engines installed in geared Diesel liner Monte Cervantes

Such plant as cannot be satisfactorily driven from the steam raised by the exhaust heat boilers when the vessel is under way is electrically operated and even the galley is electric. The demand for power for this reason is excessive, which is not surprising when it is considered that nearly 3,000 people have to be fed. The electric generating installation is, therefore, compara-

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tively large, and is of a new type so far as liners are concerned, for airless injection Diesel engines of 480 brake horsepower—two units— are employed for driving the dynamos, although there is also a 680 brake horsepower air injection Diesel motor coupled to a generator.

It is a matter of some interest that the Hamburg-South American Line, when building a new high-class large and fast liner, like the *Cap Arcona* decided to employ steam machinery, but they adopted Diesel engines in an intermediate one class vessel of lower speed. The explanation given by the owners at the time the orders were placed was that while Diesel machinery would have shown greater economy in the larger vessel, they were not convinced that such high powered engines had reached a sufficient degree of reliability to warrant their employing them in a high class liner.

The Christiaan Huygens

Of the two new Dutch motor liners which were completed within a few days of each other, and which both sailed on their maiden voyages to the Dutch East Indies from Holland in February, the Netherland Steamship Company's *Christiaan Huygens* is the larger, and, is, in fact, the biggest ship that has been built in Holland. She is also the largest trading to Java. The following are the main dimensions and particulars:

Length between perpendiculars	550 feet
Molded beam	68 feet 6 inches
Draft	28 feet 6 inches
Gross tonnage	**17,000**
Service speed	17¼ knots
Brake horsepower	11,600

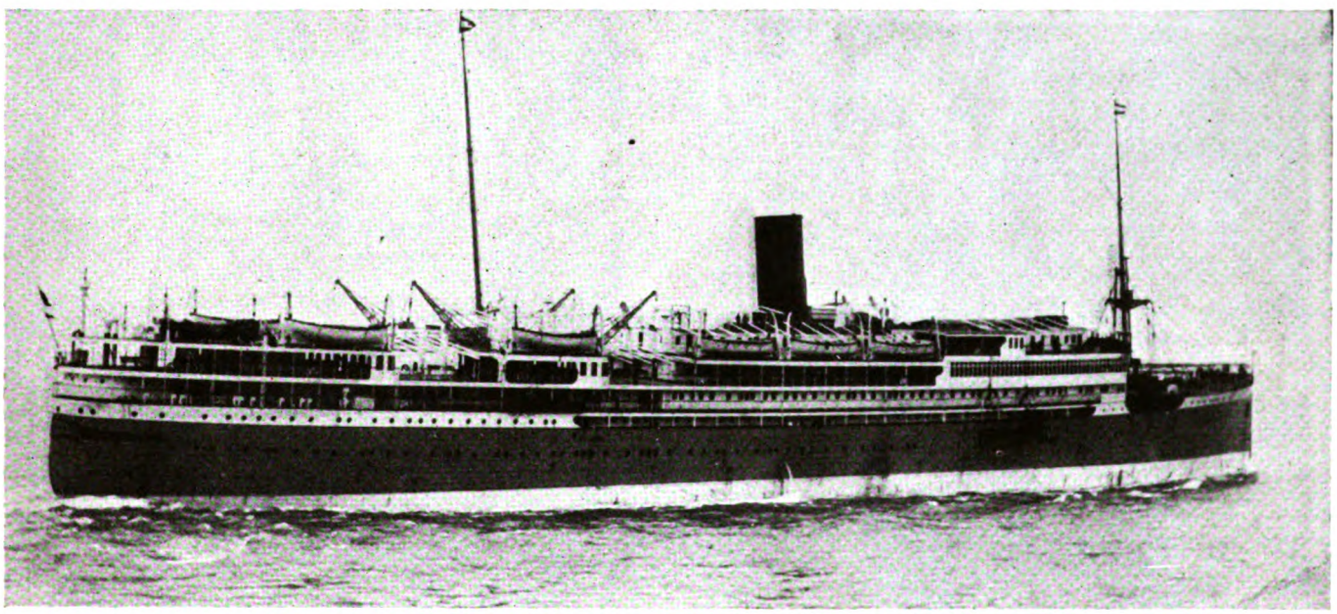
She carries in all 647 passengers, of whom 533 are arranged in first and second class cabins, a number being interchangeable, while there is accommodation for 62 third class and 52 fourth class passengers. The main saloons, including the music saloon, smoking room and writing room are on B deck, most of the passenger accommodation being on B, D. and E decks, with fourth class cabins on F deck.

Three holds are provided forward of the engine room and two aft. The oil fuel is mainly carried in large oil bunkers forward of the engine room and not in double bottoms, the tanks in the double bottoms being utilized for drinking water, cooling water and fresh water.

The two engines installed in the *Christiaan Huygens* represent the highest powered, single acting Diesel motors that have yet been fitted in a ship. Each develops 5,800 to 6,000 brake horsepower and is of the Sulzer type, having ten cylinders, the cylinders being standard in every respect, namely, with a diameter of 680 millimeters and a piston stroke of 1,200 millimeters. The engines run at 115 revolutions per minute and are supplied with scavenging air from separate turbo blowers, coupled to electric motors of about 600 brake horsepower.

The reason for the adoption of ten cylinder units, when the power could have been attained with eight cylinder motors was that the engines should be standard, except for the number of cylinders, with the machinery in the owners' other motor liner, the *P. C. Hooft,* which has Sulzer engines of the same class but with eight cylinders.

All the main and auxiliary machinery of the *Christiaan Huygens* is installed in one engine room. The generating plant consists of three Diesel engines of 650 brake horsepower coupled to 425 kilowatt dynamos, and a 275 horsepower oil engine driving a 210 kilowatt dynamo.



The 12,000-ton motor liner Sibajak

The Rotterdam Lloyd Liner Sibajak

The *Sibajak* is also for the Dutch East Indies service, and is the largest liner constructed for the Rotterdam Lloyd Steamship Company, of Rotterdam. She is 530 feet in length overall, or 505 feet 9 inches between perpendiculars, the beam being 62 feet 6 inches and the loaded draft about 27 feet. The gross tonnage is 12,100. Passenger accommodation is provided for practically 500 people, of whom 200 are berthed in the first class and 196 in the second class saloon. Normally, the speed at sea when fully laden will be 16 to 17 knots.

Sulzer type, single acting motors are also installed on this vessel, two units each with an output of 5,100 brake horsepower being fitted. They are eight cylinder models, and the speed is much lower than that of the *Christiaan Huygens,* being only 95 revolutions per minute. Consequently, the cylinder dimensions are larger than in the *Christiaan Huygens,* being 760 millimeters bore, with a piston stroke of 1,340 millimeters.

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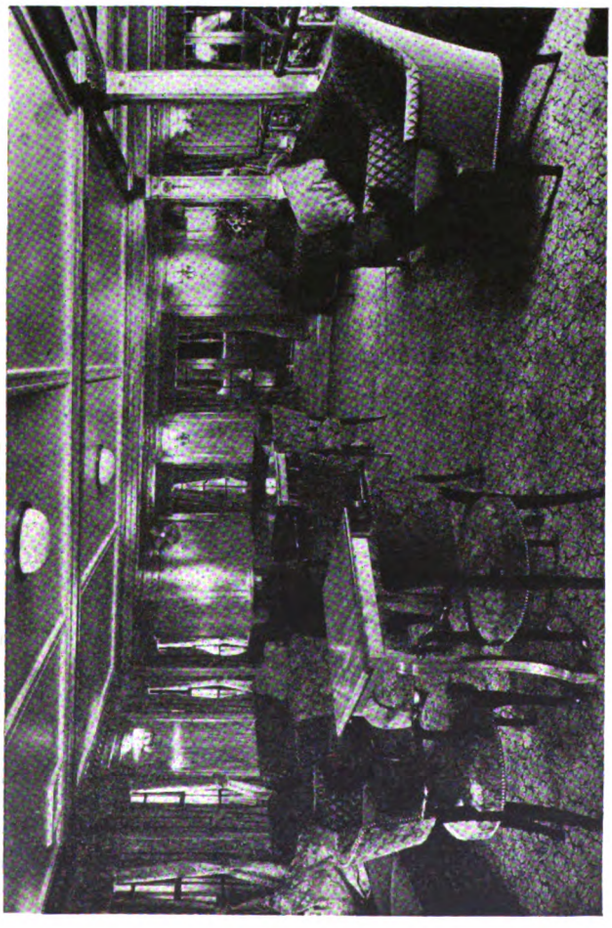
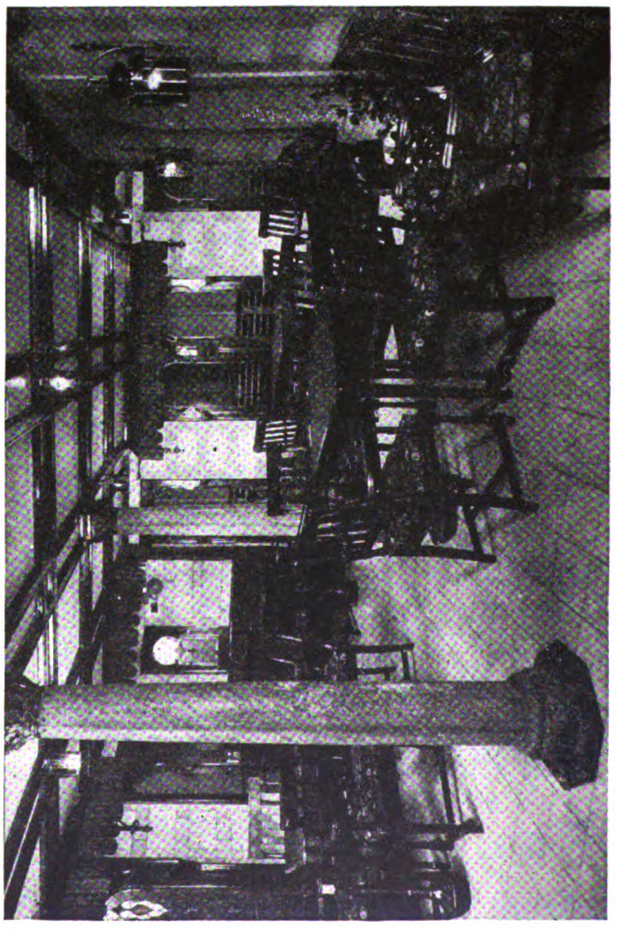
Smoking room

Dining room



Lounge



Veranda café

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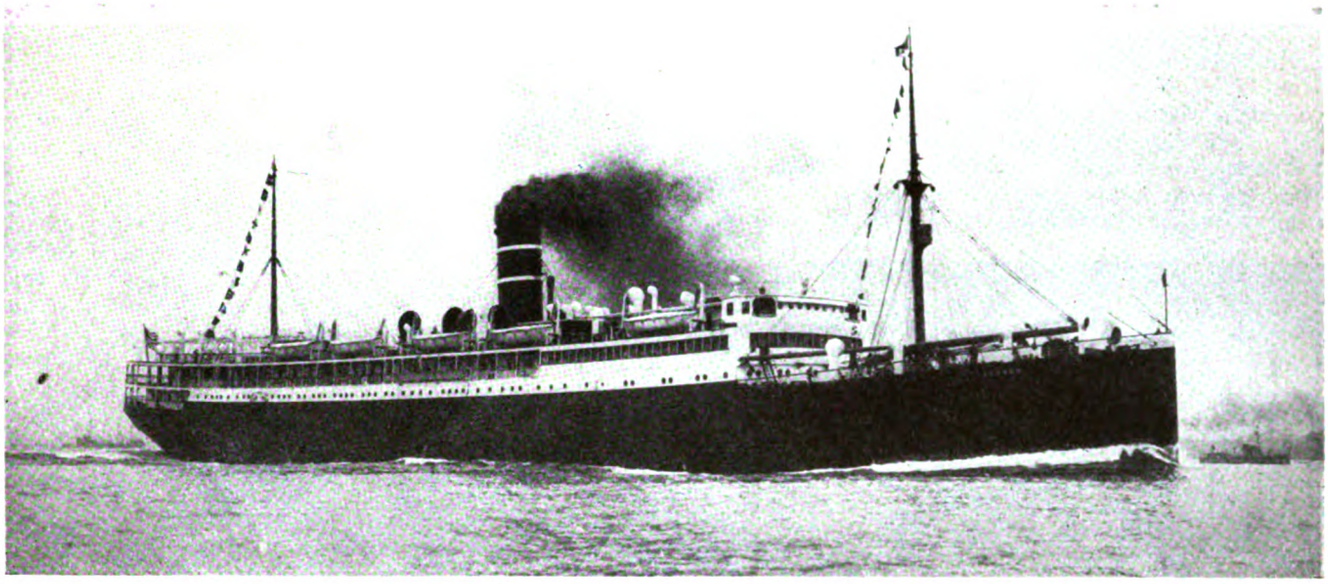

The Ward liner Havana

S. S. Havana Rebuilt For Ward Line

Complete new accommodations fitted — New boilers installed—Machinery overhauled by Todd Dry Docks, Inc.

By H. M. Wick*

THE recent sailing of the steamship *Havana* from New York on her maiden voyage to Cuba marks a new step in the progress of service improvements undertaken by the Ward Line (New York and Cuba Mail Steamship Company of New York). The *Havana* was reconditioned some time ago by Todd Dry Docks, Inc., Seattle, Wash., as a first class passenger and freight ship at a cost of $800,000. The specifications were prepared and supervision of the work was carried out by Theo. E. Ferris, naval architect, New York. The vessel will operate in her present run for the balance of the winter season after which she will enter the New York-Cuba-Mexico service.

The *Havana* was originally built for the Ward Line by the William Cramp and Sons' Ship and Engine Building Company in 1907 and operated regularly in the service to Cuba until the war when she was taken over by the Navy Department, operated as a hospital ship and renamed the *Comfort*. At the close of hostilities the vessel was placed out of commission and remained tied up at a San Francisco dock until 1927. In the spring of that year the *Comfort* was offered for sale and, as the Ward Line was in need of a ship suitable for the Cuban trade, arrangements were quickly completed with the Government and the ship was returned to her original owners.

It was necessary to have the vessel reconditioned on the west coast because of the removal of the old boilers which were no longer in condition for service. A contract for the work was therefore placed with Todd Dry Docks, Inc., to rebuild the vessel and late in June, 1927, she was towed to the yard at Seattle.

Briefly, the conditioning included the design of an entire new arrangement plan to meet the modern requirements for passenger accommodations and public spaces, the renovation of the hull, the installation of new boilers and alterations to the main engines.

The *Havana* is of the 4-deck hurricane-deck type combined passenger and freight ship with a partial double bottom. She has an overall length of 429 feet 10 inches; a length between perpendiculars of 413 feet; a molded beam of 50 feet; a molded depth to the hurricane deck of 38 feet and a designed load draft of 24 feet. The displacement and the deadweight carrying capacity at load draft are about 10,250 tons and 5,000 tons respectively. The propelling machinery consists of reciprocating engines driving twin screws which give the ship a speed of 17 knots.

Because of her former service as a hospital ship, a great deal of equipment and fittings had to be removed before the dismantling and gutting out of the ship proper could be commenced. This dismantling included the removal of practically the entire deck house erections above the hull proper, including the old boiler hatches, certain bulkheads around the old fire room, old coal bunkers, cold storage rooms, portable water tanks, ventilators, light and vent trunks. The original masts were also removed so that new mast pardners and steps could be fitted to accommodate raked masts.

In order to increase the passenger carrying capacity the vessel was bridged above the hurricane deck, the new construction taking the form of an extension of the hull sides for a distance of 118 frames. A new steel deck house was built at the end of the bridge enclosure on the hurricane deck aft. Due to the new arrangement of accommodations, the remaining portion of the original house at this location was wrecked and

* Associated with Theo. E. Ferris, Naval Architect, New York.

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rebuilt. At the after quarters of the ship, which was formerly left open to work the quarter hatches, the promenade deck was closed in and extended to the side of the ship while the former steel house on this deck was demolished from the midship portion to the after end in order to widen it sufficiently to meet the requirements of the new layout. The boat deck was

Main Lobby

extended to the side of the ship fore and aft and a new type of navigating bridge was built at the forward extension of the deck house.

A new steel boiler hatch was built according to the new arrangement plan while the engine room hatch was somewhat narrowed. In order to provide for the change from coal to oil burning boilers it was necessary to install new deep fuel oil tanks extending entirely across the ship and taking in 17 frame spaces from the tank top up to the lower deck. These, together with the double bottom fuel oil tanks, provide a bunker capacity of over 1,100 tons of oil which gives a steaming radius of about 5,000 nautical miles.

New built-in culinary fresh water tanks were constructed at the port and starboard sides forward of the engine room bulkhead. These tanks extend from the tank top up to the lower deck level and at the wings of the shaft tunnels port and starboard from the tank top up to the orlop deck level.

In addition to the foregoing, the other minor changes in the appearance outboard, the *Havana* also differs from her sister ship, the former *Saratoga,* which is still in the possession of the Navy Department as a hospital ship under the name of *Mercy,* in that her two smokestacks were removed and replaced by one large stack having a height of about 93 feet. New cargo and stowage ports have also been installed throughout the ship.

In order to obtain the best subdivision possible for safety, a new transverse watertight bulkhead was built forward in the ship extending from the tank top up to the main deck. This addition makes a total of 8 transverse watertight bulkheads. The hurricane deck forward was completely closed in as a permanent deck structure. In the vicinity of the after end of the main passageway and forward to port and starboard in the vicinity of the galley vent trunk light steel bulkheads were built in conjunction with the joiner work for the purpose of screening fire and preventing it from working fore and aft at the hurricane and promenade deck levels. At the above locations in the passageways heavy steel fire doors were fitted.

Propelling Machinery Alterations

The propelling machinery on the *Havana* consists of a pair of vertical inverted direct acting 3 cylinder triple expansion engines. With the installation of new boilers the working pressure was raised from 180 pounds per square inch to 205 pounds per square inch. This increase in pressure necessitated decreasing the diameter of the high pressure and intermediate pressure cylinders and to this end liners were fitted. As the main engines and auxiliaries had been overhauled by the Navy Department at some time prior to the purchase of the vessel by the Ward Line, very little in this direction was required at the Todd plant. However, nearly all the machinery was opened and inspected and repaired wherever necessary. The pumping equipment was found to be in good condition and did not require renewal except for the installation of two new Worthington fuel oil pumps. Eight new Babcock and Wilcox watertube boilers, equipped to burn oil fuel under forced draft and arranged in two fire rooms, were installed. These boilers have a total heating surface of 21,136 square feet. Two new forced draft blowers each driven by an independent vertical engine were installed. This equipment was manufactured by the B. F. Sturtevant Company, Hyde Park, Boston, Mass. With the new steam pressure of 205 pounds per square inch delivered by these boilers and the changes in the main engines, the propelling machinery develops a total of 10,000 shaft horsepower.

Three new generating sets, manufactured by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., were installed in the engine room. These units consist of a single wheel impulse turbine geared to a 75-kilowatt direct current generator. The turbine nozzles are designed to operate with a steam

De luxe stateroom

pressure of 220 pounds per square inch, no superheat, and to exhaust into a 26-inch vacuum referred to a 30-inch barometer. These generators deliver current at 230 volts for operating electric cargo winches so that in order to provide for lighting service and other requirements two Westinghouse 100 ampere 110-volt balancing sets were also installed.

Passenger Accommodations

Rooms for a maximum of 200 first class and about 65 second class passengers have been provided in the new accommodations of the *Havana* and these, with a crew of about 135 men, make up a total of approxi-

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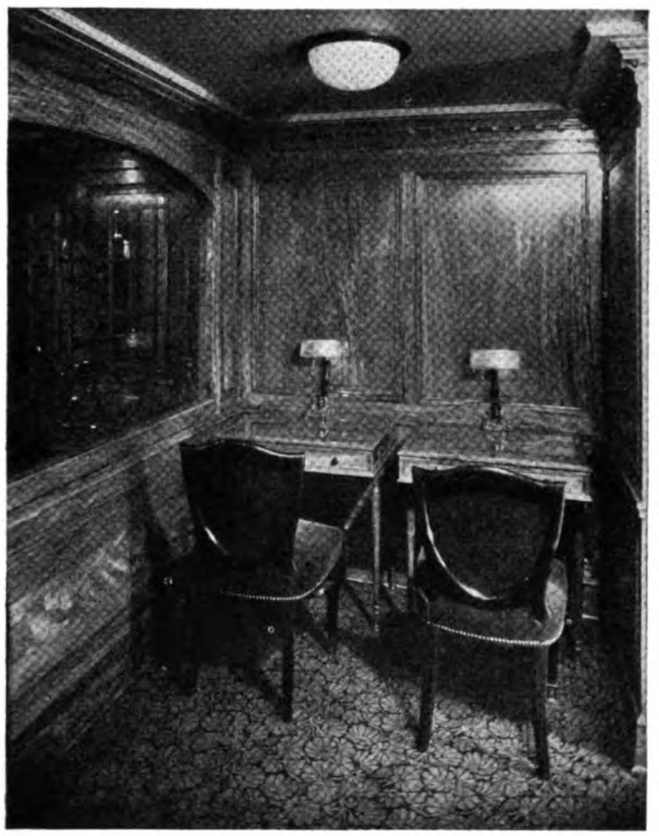
mately 400 persons on board. For the first class passengers 16 suite rooms with connecting bath, 23 special staterooms, some with private toilet and shower and others with private toilet alone, are provided. The balance of the first class accommodations consist of regular outside and inside staterooms. The second class passengers are berthed in two 4- and 6-person rooms at the lower after end of the ship.

The first class rooms are modern in every respect and are equipped with mahogany enameled twin and double metal beds in the suite rooms and special rooms and mahogany enameled metal upper and lower berths and settee berths in the regular rooms. The upper berth is of the folding Pullman type as devised by the Simmons Bed Company. One excellent feature incorporated in the passenger spaces and staterooms throughout the entire ship is that ceilings are fitted and no steel work is exposed.

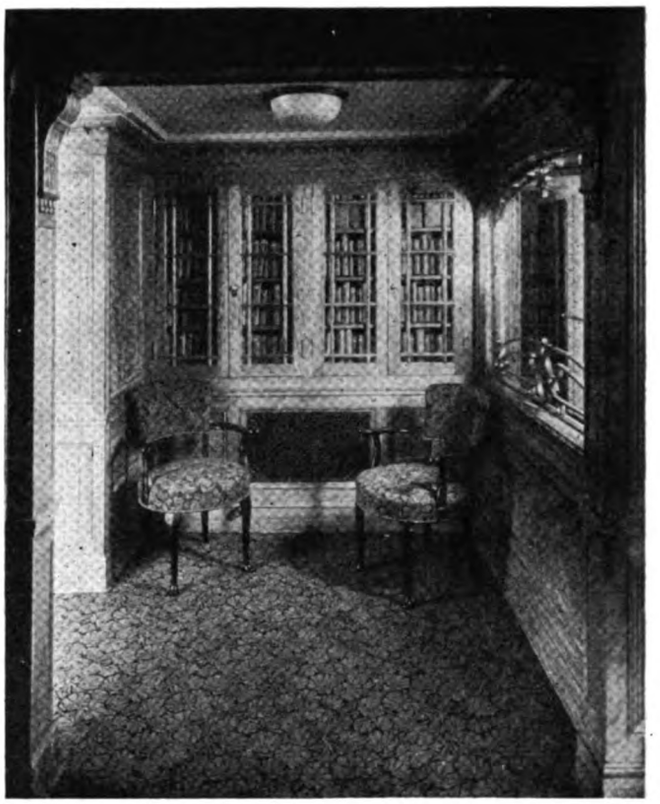


Writing room

The decoration of the public spaces, as planned by Donald G. MacKee and Theo. E. Ferris' staff, are excellent examples of modern marine interiors. For example, in the deck veranda and tea room, which is located at the after end of the promenade deck house, a Moorish effect has been obtained with Zenitherm tiled walls and columns, a large block tiled floor, colored striped awnings standing out from teakwood casement windows and doors which are rounded at the top and fitted with stained leaded glass. The lighting fixtures in the shape of hanging lanterns are of an ornate type in keeping with the decorative scheme. An electric fountain with flowers growing at the base is fitted at the forward bulkhead of the room. The ceiling of this room is finished in teak cross beams with panels of cream enameled Vehisote between the beams.

Just forward of the deck veranda is the first class smoking room with toilets, service room, beverage room and a pantry making this space complete in itself. Here the entire decorative scheme is based on white oak paneling and ceiling beams between which painted Vehisote panels are fitted. The chairs, tables and built-in settees are also of white oak with brown leather upholstery. The radiators are concealed beneath the settees with a metal grille at the front to permit radiation of heat.

The first class lounge and music room is located forward on the promenade deck and here special care was taken to make it the most attractive public space on the ship. In general, the room is finished in full height raised panels of white mahogany with cornice moldings and full height fluted pilasters with carved caps. The sash window trim, doors and door trim are also white mahogany. The ceiling beams are capped with white mahogany and large panels of painted Vehisote are fitted between them. In the center of this room is a large light and air well extending down to the dining saloon. This well is enclosed to wainscot height with a hand rail around the top. At the center over the light well at the level of the boat deck is a large stained and leaded glass dome arranged with bronze grilles to provide ventilation. At the after end of the lounge is the library on the starboard side. This space is fitted with mahogany bookcases and panel work. On the port side, a writing room, fitted with desks and chairs of white mahogany completes the lounge.



Library

The first class dining saloon seats about 130 persons and is a combination of mahogany and enameled finish with full height fluted pilasters and columns having carved caps. To a height of about 30 inches the walls are fitted with mahogany paneled wainscotting and moldings. The air ports are screened from view by ornamental stained glass sliding sash windows fitted

(*Continued on page 171*)

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Need of Merchant Marine Emphasized At Plunkett Testimonial Dinner

REAR Admiral C. P. Plunkett, U. S. N., was the guest of honor at a testimonial dinner given at the Waldorf-Astoria, New York city, on the evening of February 15 by leaders in the fields of transportation, industry and finance as well as in the Army and Navy. The occasion was not only Admiral Plunkett's 64th birthday but also marked his retirement from active duty in the Navy. Colonel E. A. Simmons presided as toastmaster and the proceedings were broadcast over the Blue Net Work of Station WJZ of the National Broadcasting Company.

At the request of the Admiral, who is one of the foremost advocates of the American merchant marine, the dinner was made the occasion for a discussion of the future of American shipping. Admiral Plunkett stated that it is not so much a question of how many shipping bills are before Congress at the present time as it is of our law makers framing a bill that the President will sign. He warned his hearers that with conditions as they are the time may come when the art of building ships will disappear in this country and then a merchant marine will be out of the question. When you have failed to keep intact the trained personnel in the shipyards, he said, you have failed entirely. No nation has ever been great that was not great on the seas and he urged American citizens to return to the sea and maintain the freedom of the seas. The maintenance of an adequate merchant marine backed up by a sufficient navy, he declared, will be a big factor in the future of the entire country and of the history of the world.

Opposes Ship Subsidy

Speaking from the viewpoint of the farmers of the Middle West, L. J. Taber, Master of the National Grange, said:

That there may be no misunderstanding, let it be clearly understood that the Grange, an organization of farmers, with a million dues-paying members in 33 states has been in the past and still is opposed to a ship subsidy as a means of stimulating the merchant marine. We are not unmindful that increased costs of shipbuilding, and that maintenance are higher in America than abroad. There are practical steps that the Government can and should take to foster a sound American merchant marine policy.

First, the American people should become ship-minded and appreciate the basic relation of a sound merchant marine policy to our commercial expansion, our national defense and to the prosperity and happiness of all our people.

Second, the Government could wisely provide long-time amortized loans at low interest cost to stimulate shipbuilding similar to the principles involved in our Federal Farm Loan System.

Third, the Government should divert the carrying of mail and official business to American-owned or Government-operated ships.

Study our mail system and you will find that our own Government will give its mail to a foreign ship if it makes faster and quicker delivery than a ship flying the American flag. On the other hand, it will be observed that England and most European countries divert their mail toward ships flying their own flag.

We mention the fact that the Government should give more substantial attention to ships under the American flag to remind our hearers that today we have a substantial tonnage of cargo-carrying ships the property of the people of the nation, built as a war emergency. We need legislation and public sentiment to see that these ships are used for the good of agriculture and America.

Favors the Jones Bill

The Grange favors the principles of the Jones shipping bill which recently passed the Senate because we believe that the ships built by all the people, belonging to all the people, should be used for the good of all the people. We are not unmindful of the traditional policy of our organization and of the American people against the Government doing anything that can be done equally well or better by private capital and private initiative. But the decline of American shipping in recent years, the humiliating position in which the nation found itself at the beginning of the world war, and the disastrous conditions which confronted us, compel us to insist that the rights of the public be protected, and that vessels belonging to the Government be administered in a sound business manner as any great business interest would handle its own affairs.

Lakes-to-Sea Waterway

In this connection emphasis should be placed on the lakes to the sea waterway either by the St. Lawrence or all-American route. The bringing of the great inland empire to the sea will have a direct effect on the merchant marine policy of the nation. It will reduce freight rates. It will move westward industrial expansion and add greatly to the commerce of the nation. It will also have an outstanding effect on our understanding and appreciation of the value of the "trade lanes" of international commerce. At present the farmer of western Canada can ship his grain across Canada up the St. Lawrence River to Liverpool for much less than the farmer in Kansas or Nebraska can move his grain to the seaboard and to European markets.

As to agriculture's interest in the merchant marine, the great problem of rural life today is the problem of our exportable surpluses. Unless we have means and agencies to see that this surplus, which after all determines the price of most of our agricultural products, has a means of finding its way to foreign markets, there can be no final solution of our farm problem.

We all prefer that our shipping be in private hands, but with our vast investment in ships, with government support given shipping in other nations, there comes a practical demand that America develop trade routes for the good of commerce and of agriculture. The keeping of trade lanes open and the development of markets has a value more substantial than sometimes is appreciated. This will require that for years certain routes of shipping will be operated at an apparent loss, but the question is not, "can we afford a merchant marine, but whether can we afford to do without it?"

Demands Replacement of Obsolete Ships

No one would call the hundreds of millions of dollars spent in operating the Navy a deficit. If we can spend hundreds of millions of dollars to operate our Navy, we certainly ought cheerfully to spend a few million dollars to operate its second line of defense. And more than this, we should demand that there should be replacement and new equipment to keep the investment of the people at a point where service may be rendered.

Let us maintain a merchant marine in private hands if we can but a merchant marine as a government agency if we must. American agriculture challenges our wisest statesmen to direct their attention toward sound and constructive policies that will keep the Stars and Stripes floating upon the seas and guarantee to the tillers of the soil trade lanes for the product of his toil reaching to the furthermost corners of the world.

Attitude of Bankers and Business Men

C. W. Lonsdale, chairman advisory committee of the transportation department of the United States Chamber of Commerce, expressed the views of business men and financiers with regard to the merchant marine in part as follows:

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The Chamber of Commerce of the United States is emphatically for an American merchant marine. It realizes that we must have a merchant fleet adequate to serve our foreign trade in peace time and our defense needs in war time. It believes that the American flag at the mast head in foreign ports contributes an important influence in the building up of our trade.

The Merchant Marine Act of 1920 was obviously an incomplete piece of legislation—important questions were left to be worked out in the future. The efforts made by the Administration in 1923 to secure supplementary legislation in the form of ship subsidy failed of enactment. In the two years that followed the Chamber of Commerce made a number of preliminary studies of the shipping question, and in 1925 the board of directors authorized the organization of a National Merchant Marine Conference to take up the problems in a thorough-going manner.

Favor Private Ownership

The results showed a unanimous view in favor of a merchant marine under private ownership, and a practically unanimous view in favor of the necessary government measures to enable private owners to furnish the needed services and to enable the government to retire from the shipping business.

The idea which met with universal approval was that the trade route services to the various foreign trade regions of the world should be maintained, and that they should continue to serve the principal ports along the different sections of our seaboard in such a way as to allow, over a period of years, these sections of the country to develop.

There was practically unanimous approval that these services should be secured by contracting with private owners to supply the necessary ships and maintain them in service.

Measures Before Congress

There are now several legislative proposals before Congress. There is the Jones bill, which has been passed by the Senate, frankly a government ownership measure—a measure which is predicated on the idea that the American people will not approve the steps necessary to success of shipping in private hands, and that the only alternatives are government ownership or no merchant marine. The Chamber does not subscribe to such a ruinous doctrine.

There is also before Congress the Copeland bill, providing for mail contracts with the aim of securing a successful merchant marine in private hands. The Chamber is in accord with the purposes of this bill and believes that some of its principles should be included in the legislation adopted by Congress.

There is also the Wood bill, which would provide a variety of additional aids to shipping, mail contracts, aid to shipbuilding, transfer of the Army, Navy and Panama Railroad services to private operation, early disposal of the government-owned fleet and a number of other proposals. With some of these the Chamber is in accord and on others it has taken no position.

We believe that Congress should write the necessary legislation. It has before it ample suggestions as to ways and means for putting American shipping on a sound and permanent basis, a basis of private—and not government—ownership.

There should be no hesitancy on the part of our law makers to approve measures entirely consistent with traditional American policy,—that is, to foster an essential and vital function, such as this, in the way it should be fostered if it is to succeed—and that is to encourage private enterprise.

Other speakers included Hugh Frayne, representing William Green, president of the American Federation of Labor; Major General Charles P. Summerall, Chief of Staff, U. S. Army; and Rear Admiral Bradley A. Fiske, U. S. N., retired.

Steamship Havana

(*Continued from page 169*)

with bronze folding grilles. The overhead deck girders and athwartship beam girders divide the ceiling into bays. These girders are encased in mahogany and large panels of Vehisote, manufactured by the Pantesote Company, New York, are fitted between the beams.

At the forward end of the promenade deck and on each side for a considerable distance aft there are fitted above the enclosed rail heavy plate glass frameless sliding windows, manufactured by the Kearfott Engineering Company, New York. At the after end of this enclosure are large swinging teakwood doors with heavy glass on the upper half.

Natural and Mechanical Ventilation Systems

A complete new arrangement of natural ventilation by means of metal ventilators and cowls is provided to suit the new layout of passenger and crew spaces, public spaces, cargo holds and machinery spaces. In addition, an extensive system of mechanical ventilation is installed for inside passenger staterooms, crew living spaces, mess rooms, galley, main pantry, serving pantry and the like. The electric fans used in all these spaces were supplied by the Westinghouse Electric and Manufacturing Company.

The passenger quarters are protected throughout by the Cory electro automatic fire detecting and alarm system. The new Foamite system using a foam generator is installed in the engine and fire rooms and below the fire room floors for use in extinguishing incipient fires in these places. For detecting fires in the cargo spaces the Rich fire detecting system has been fitted. A new emergency alarm bell system is installed, with, in addition, a mechanical watchman's clock system having 18 key sets. Part of the fire extinguishing systems has been renewed and most of the hose and hose connections as well.

Miscellaneous Equipment Newly Installed

A 2-kilowatt Independent Wireless Telegraph Company, radio transmitting and receiving apparatus and auxiliary transmitter are installed. Emergency power for the radio installation, supplied by 60 cells of the type M V—11 Exide storage battery, manufactured by the Electric Storage Battery Company, are fitted. In addition, a 7½-kilowatt emergency generating set is installed on the boat deck adjacent to the radio room.

New mechanical telegraphs of the Cory make are installed in the wheel house, engine room and docking station aft. Two separate systems of inter-communicating selective-calling telephones are fitted and in the main engine room a telephone booth is provided. This, with a new speaking tube system, completes the communication system.

The *Havana* has a lifeboat capacity for about 450 persons. Five of the lifeboats are new and 5 were overhauled and rebuilt at the Todd yard. All davits on the vessel are new.

Eleven new cargo winches, constructed by the Lidgerwood Manufacturing Company, are installed to serve the hatches, four of these being steam driven and 7 electrically driven. The motors and cam control for the electric winches were manufactured by the Westinghouse Electric and Manufacturing Company, each winch motor developing 27 horsepower operates on 230 volt direct current. The old windlass, capstan, steam and hand steering gear were completely overhauled.

Refrigerating System

An entirely new refrigeration plant, manufactured by the Brunswick-Kroeschell Company, New Brunswick, N. J., consisting of compressors, condensers, brine coolers, refrigerator coils, drinking water cooler, etc., is installed. An insulated space of 10,850 cubic feet has been provided to accommodate cargo to be held at a temperature of 16 degrees Fahrenheit. In addition, a space of 3,300 cubic feet is utilized for ship's and steward's stores. The refrigeration system also accommodates a 260-gallon capacity drinking water cooler. The refrigeration is supplied by 3 Brunswick double cylinder 8-ton steam-driven ammonia compressors operating on the brine circulating system.

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Questions and Answers for Engineers

Practical information on the operation and maintenance of boilers, engines and auxiliaries

This department is maintained to help those who desire practical information regarding engine room problems or who are preparing to take examinations for a marine engineer's license. Readers are urged to send in questions. Inquiries bearing the name and address of the writer will be answered promptly by mail. If the question is of general interest the answer will also be published in an early issue of the magazine, although the identity of the writer will not be disclosed in doing so. Anonymous communications will not be considered.

CO_2 Refrigerating Machine

Q.—What are the three essential parts of a Hall carbonic anhydride CO_2 refrigerating machine?

A.—The compressor (in connection with which are the only moving parts) in which the gas drawn from the evaporator is compressed to such a pressure as is necessary to liquefy it; the condensor, which consists of coils of pipe, in which the compressed warm gas is cooled by the action of the cooling or circulating water, and is liquefied, and the evaporator which also consists of coils of pipe in which the liquefied CO_2 evaporates, thereby producing the low temperature required to cool the brine.

Causes of Trouble in Refrigerating Machine

Q.—Give several possible causes of trouble in a CO_2 refrigerating machine and a remedy for each.

A.—(1) Under-charge of CO_2 due to leakage, or to a rise in temperature of condensing water. To remedy this add more gas until the CO_2 gages show indications under the heading "working conditions."

(2) The compressor gland packing may be worn. This will be indicated by the pressure lubricator piston working out to its full stroke in one hour or less and not improving after the gland nut has been tightened. This may also occasionally be caused by a defective piston leather in the pressure lubricator itself. To remedy, carefully examine the piston rod for roughness of scoring; if necessary, use a spare rod and renew packing. Re-polish the rod that is taken out.

(3) The piston rings may be worn. This will be indicated by the compressor failing to pump out the evaporator. The valves may be worn or stuck. If piston rings are worn, they should be renewed. The valves should be examined, cleaned and refaced if necessary.

(4) Irregular action of evaporator gage and also delivery pipe from compressor changing from hot to cold frequently without any apparent reason indicates that there is some foreign liquid in the system, probably oil from the pressure lubricator which has not been drained from the separator.

To remedy this, the brine in the evaporator should be warmed up to a temperature of about 150 degrees F., then with all CO_2 valves open the machine should be run (with brine circulation stopped). Close the regulator and pump the gas over into the condensor; then open the regulator and allow the gas to rush over into the evaporator. Repeat this several times, opening the drain on the separator frequently. In extremely bad cases it would be necessary to steam out the coils, afterwards thoroughly drying with hot air. Sometimes the use of a little alcohol may give temporary relief by opening the compressor and putting in a quarter pint for a small machine or a half pint for a large machine, then close the compressor, bar round and then run the machine, draining the separator frequently.

Spare Parts for Refrigerating Plant

Q.—What spare parts and stores would you consider necessary to carry for a CO_2 refrigerating plant?

A.—Flasks of CO_2, calcium chloride, refrigerating oil, compressor piston rings, compressor gland packing rings, pressure lubricator leathers (two sizes), set of suction and delivery valves, set of copper joint rings for compressor, a highly polished compressor piston rod, safety valve disks and one log book.

Gland Oil for Ice Machine

Q.—What would you consider a good gland oil for an ice machine?

A.—An oil with the following specifications: Specific gravity, 0.894; flash point, 320 degrees F.; freezing point,—30 degrees F., and viscosity, 135—140 seconds.

Temperature Correction in Measuring Fuel Oil

Q.—What method would you use for making temperature adjustment in ascertaining net quantities of fuel oil?

A.—The divisional method. Multiply the difference in temperature above 60 degrees F. by 0.0004, add 1 and use the result as the divisor in dividing the gross barrels; the product will be the net barrels. For example, if 8,000 barrels of fuel oil were received at a temperature of 100 degrees F., the temperature correction would be worked out as follows:

100-60 = 40 degrees, difference in temperature
(0.0004 × 40) + 1 = 0.016 + 1 = 1.016
8,000 ÷ 1.016 = 7,874.01 barrels or actual net quantity of oil received at 60 degrees F.

Area of Safety Valves

Q.—What is the United States Steamboat Inspectors' rule for determining the area of lever safety valves and spring pop safety valves for marine boilers?

A.—Lever safety valves shall have an area of not less than 1 square inch to every 2 square feet of grate surface in the boiler and the seats shall have an angle of inclination of 45 degrees to the center line of their

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axis. Three square feet of grate surface are allowed to each square inch of safety valve area for a spring pop valve.

Water Hammer

Q.—What causes a water hammer in a pipe or cylinder?

A.—If a stop valve or throttle valve is opened suddenly, the large volume of steam that enters the cold steam pipe or cylinder will be condensed and a partial vacuum will be formed. This will be followed by another rush of steam with the same result, and so on until a mass of water will collect, and as it rushes through the steam pipe will strike the first bend in the line with great force sometimes causing either pipe or cylinder head to break.

Pitch of Rivets

Q.—What is meant by the pitch of rivets in a joint?

A.—It is the distance from center to center of the rivet holes in the same row.

Flare-Back

Q.—What is the meaning of the term "flare-back" when used with reference to oil-burning boilers?

A—A flare-back is the result of the explosion of a mixture of oil vapor or gas and air in the furnace. Such an explosion may seriously damage the boiler and injure personnel. Its occurrence is most likely when lighting up or attempting to relight an atomizer from a hot brick wall.

In order to prevent flare-backs as much as practicable, oil must not be allowed to accumulate in the furnace. Floors must be wiped up and atomizer control cocks or valves kept tight at all times. If atomizers are accidentally extinguished, shut off the oil and blow steam or oil through the furnace before relighting. Do not attempt to relight an atomizer from a red hot brick wall; use a torch. In order to minimize the danger in lighting atomizers by the use of a torch, the fireman should stand as well clear as practicable.

Machine Efficiency

Q.—What is meant by the term "machine efficiency"?

A.—In operation a machine receives and delivers energy. The energy so received is termed "input" and that delivered is termed "output." Some of the energy is always lost in the machine; therefore the output is always less than the input. The machine efficiency is the ratio of output to input.

Why Air Should Be Kept Out of Boilers

Q.—Why is so much emphasis placed upon the necessity of keeping air out of boilers, feed tanks and feed systems?

A.—When iron, oxygen, moisture and carbon dioxide are all present, conditions are ideal for rapid and continuous rusting. The first step is the formation of an oxide. This is reduced to a carbonate, which in turn breaks up, forming hydrated oxide and setting free carbon dioxide to continue the process.

A greater or less amount of air is likely to enter the boiler through the feed water or occasionally is drawn into the feed pump and sent on to the boiler. Free carbon dioxide may also be liberated from the salts entering with the make-up feed and thus all the conditions for continuous rusting may be present. In the absence of free carbon dioxide, iron oxide may be formed. This combined with electro chemical reactions may result in serious local corrosion. Also in heating the feed water, air may be lubricated and the oxygen at the instant of liberation appears to be very active chemically.

It is in order to assist in decreasing the possibility of the above elements being present together in the boiler that every effort should be made to keep air out of the boiler itself and the feed systems.

Blow-Off Valves

Q.—Explain the purpose of the bottom and surface blow-off valves.

A.—The purpose of the bottom blow-off is to make possible the emptying of the boiler when necessary and of discharging the loose mud and sediment that collects in the bottom of the boiler from the feed water, and when raising steam in a cold boiler it is used as a suction valve to the pump when circulating the water. The surface-blow serves the purpose of removing floating impurities that would eventually settle and fall to the bottom of the boiler if not removed.

Jet vs. Surface Condenser

Q.—What is the difference between a jet condenser and a surface condenser?

A.—In a jet condenser the exhaust steam and the condensing water mix and the exhaust is condensed by contact with the circulating water, while in a surface condenser the exhaust steam and the condensing of circulating water do not come in contact with each other. The exhaust steam is condensed by coming in contact with metallic surfaces that are kept constantly cool by the sea water flowing over them.

Effect of Grease on Condenser Tubes

Q.—What effect will grease have on the tubes of a surface condenser?

A.—As grease is a non-conductor of heat, the efficiency of the condenser is seriously affected or impaired when the tubes become thickly coated with it. The grease must be removed by either boiling out the condenser or taking out the tubes.

Cause of Low Vacuum

Q.—What may be the reason of an imperfect or low vacuum in a condenser?

A.—A low vacuum may be caused by an insufficient supply of circulating water. The air pump may be out of order, the condenser may be dirty or the tubes plugged with shells or sea grass, or there may be air leaks.

Erosion of Turbine Blading

Q.—What is the source of the erosion of turbine blading?

A.—The erosion of turbine blading is a phenomenon attendant upon the use of the higher steam pressures of the present day. It is probably due to the impact of water suspended in the steam.

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Questions and Answers Relating to Ship Design and Construction

By J. L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Squat of Vessel at Varying Speeds

Q.—Is there any formula or method of deriving the amount of squat or drag of a vessel at varying speeds? If so, can you supply the formula and the data necessary to work it out? J. A. H.

A.—The writer knows of no formula which is applicable to the question which you ask. It is believed that the best treatment of this subject is to be found in Taylor's "Speed and Power of Ships" published by John Wiley & Son, Inc., New York. The following material is largely taken from this publication.

When conducting tests in the U. S. Model Basin for the resistance of ships, it is customary to measure the change of level of bow and stern and record this change

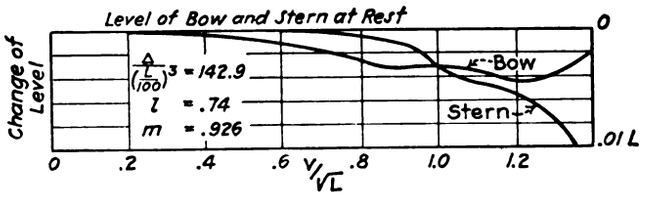

Chart showing change of level of bow and stern

on a base of speed length ratio. The results so plotted apply linearly to model and ship at corresponding speeds. The sketch shows an example of the curves just referred to.

The differences in level of bow and stern from the still water location are expressed as fractions of the length of the model. The data are then applicable to any size of ship built to the lines of the model. Having given such information, actual values of the change of level can be determined for any speed and length of ship by multiplying the length of the values of the curve ordinates for the proper values of the speed length ratio, $\frac{V}{\sqrt{L}}$.

The values of the displacement-length, the prismatic and midship section coefficients applying to the model, are shown on the sketch.

Attention is invited to the fact that for screw vessels proceeding under their own power, the values of rise and fall are probably somewhat greater, due to the effect of propeller suction, than would be indicated by towing tests in the Model Basin.

Admiral Taylor summarizes the results of his experiments as quoted:

1. At low and moderate speeds below $\frac{V}{\sqrt{L}} = 1.0$ both bow and stern settle. For short full vessels this bodily settlement is much greater than for long fine vessels.

2. Below $\frac{V}{\sqrt{L}} = 1.0$ about, there is little or no change of trim. In the majority of cases the bow settles a little faster than the stern, particularly for rather full vessels.

3. As speed is increased beyond $\frac{V}{\sqrt{L}} = 1.0$ the bow settles more slowly, reaches an extreme settlement at about $\frac{V}{\sqrt{L}} = 1.15$. and soon begins to rise rapidly, reaching its original level when $\frac{V}{\sqrt{L}} = 1.3$ to 1.4, and continuing to rise. The stern settles more and more rapidly beyond about $\frac{V}{\sqrt{L}} = 1.2$, and settles much more rapidly than the bow rises, so that the ship as a whole continues to settle while rapidly changing trim.

4. At about $\frac{V}{\sqrt{L}} = 1.7$ to 1.8 the stern is settling less rapidly than the bow is rising, so that bodily settlement reaches its maximum. The stern does not change its level much beyond $\frac{V}{\sqrt{L}} = 2.0$, while the bow rises always with increase of speed, the result being that the vessel is rising again at speeds beyond $\frac{V}{\sqrt{L}} = 2.0$ about. The center of ordinary vessels will never rise to its original level at any practicable speed; but, since the effect of the passage of the vessel is to depress the immediately surrounding water, it may seem at very high speeds as if the vessel had risen above its original level.

Vessels of special forms and skimming vessels if driven to extreme speeds may rise bodily.

Horsepower of Tug Boat

Q.—We have a tug boat 81 feet long, 21 feet beam, 9 feet 6 inches draft (hull lines are very full), in which is installed a 13 by 26 by 18-inch stroke compound engine, using 250 pounds of steam. I would like to know the dimensions of a propeller for heavy towing that will hold this engine to 130 revolutions per minute towing. The diameter limit is 7 feet 6 inches.

I would also like to know what is the approximate horsepower of this engine at 130, 140 and 150 revolutions respectively. The engine runs, condensing, with 25 inches of vacuum.—J. S. W.

A.—The information furnished relative to hull form is not in sufficient detail to make possible a satisfactory estimate of the hull resistance. In order to work out an approximate solution, the curve of effective horsepower of a somewhat similar tug has been assumed as applying and is shown in the sketch. The hull form and appendage data are also included.

The machinery data given has also been supplemented by assumption as indicated. The calculations for horse power follow.

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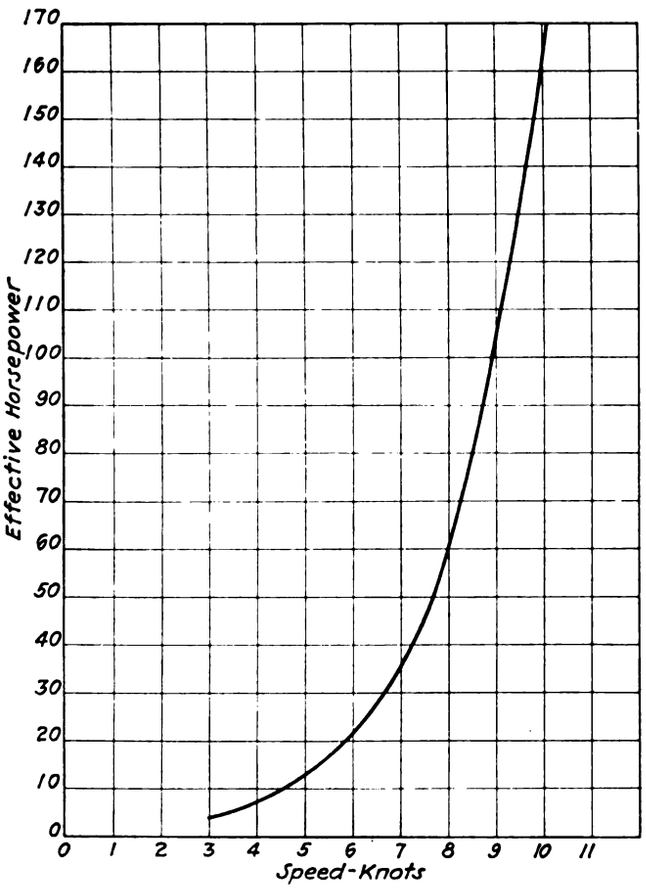

Curve of effective horsepower for harbor tug

Length at waterline, 82 feet; beam at waterline, 20.5 feet; draft (body), 9 feet; draft to bottom of wood keel, 10 feet; displacement, 220 tons; midship section coefficient 0.81. Appendages in place during towing: rudder, keel and stern frame.

The investigation of the propeller problem will follow at a later date inasmuch as there has been insufficient time to prepare same to date.

Diameter of H. P. cylinder = 13 inches
Diameter of L. P. cylinder = 26 inches
L = stroke, feet = 1.5
Boiler pressure, pounds absolute = 265
P = steam pressure in chest, pounds absolute = 255 (assumed)
High pressure cut-off = 60 percent (assumed)
Area H. P. cylinder, square inches = 132.7
A = Area L. P. cylinder, square inches = 531

$$\text{Ra} = \text{number of expansions} \frac{531}{132.7 \times 0.60} = 6.67$$

Pressure corresponding to vacuum = 2.47 pounds absolute
B_p = back pressure = 2.47 + 2 = 4.47 pounds absolute
M.R.Po. = theoretical mean referred pressure

$$\text{M.R.Po.} = P \times \frac{1 + \text{hyp. log Ra}}{\text{Ra}} - Bp$$

$$= 255 \times \frac{1 + 1.898}{6.67} - 4.47 = 106.3 \text{ pounds absolute}$$

Card factor = 57 percent (assumed)
M.R.P. = mean referred pressure, actual = 106.3 × 0.57 = 60.6 pounds absolute
N = revolutions per minute = 130, 140 and 150

$$\text{I.H.P. at 130 R.P.M.} = \frac{\text{PLAN}}{33{,}000} = \frac{60.6 \times 1.5 \times 2 \times 531 \times 130}{33{,}000} = 380$$

$$\text{I.H.P. at 140 R.P.M.} = \frac{140}{130} \times 380 = 409$$

$$\text{I.H.P. at 150 R.P.M.} = \frac{150}{130} \times 380 = 438$$

New Books

SHIPBUILDING AND THE SHIPBUILDING INDUSTRY. By J. Mitchell. Size, 7 by 4½ inches. Pages, 116. Illustrations, 12. London, 1927: Sir Isaac Pitman and Sons, Ltd.

In this book, shipbuilding, one of the greatest of essential British industries, is dealt with on clear and broad lines following the conditions and processes necessary from the inception of a new ship on to her completion and subsequent service. Special reference is made to the material and labor problems involved. While all types of vessels are dealt with, in order to avoid vague generalities, a representative modern cargo ship has been designed and the underlying principles in her construction are carried on where desirable, to provide definite knowledge and as a basis for comparison with other ships.

THE MOTORSHIP REFERENCE BOOK. Size, 8½ by 5½ inches. Pages 228. Illustrations, 67. London, 1928: Temple Press, Ltd.

This is the fourth of a series of reference books published by *Motorship* and gives a list of every motorship built or ordered prior to January 1, 1928. Details with particulars of owners, engines and hull builders, types of machinery and dimensions are given. There are chapters containing full particulars of the progress that has been made with motorship and marine oil engine construction during the past year. The list of bunkering stations where fuel oil is obtainable has been brought up to date, while a section is devoted to a review of the properties of both fuel and lubricating oils for motorships, together with ruling prices.

Communication

Four-Day Liners

Annapolis, Md.

TO THE EDITOR:

I have read with much interest the editorial and notes in regard to the 4-day liners appearing in the February issue. It seems to me that a project of this kind should secure the backing of everyone interested in our having an adequate merchant marine. The basic idea of the project certainly appears to be sound, and it is an instance where the Government, through the Shipping Board, can help industry and give the American merchant marine a few fast ships that can be pointed to with pride. The project also includes important elements that should tend to develop commercial aviation.

There is, however, some comment on the feasibility and desirability of some of the particulars as given in the notes and editorial of the February issue.

Size and Speed of the Vessels

The speed and displacement appear to be too large for economical operation. If the speed were reduced to 28 to 29 knots, which is considerably faster than any existing liner, the power required would be about 50 percent of power required for 33 to 35 knots. This would cost materially less and also leave more weight

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and space for passenger quarters and for freight. The speed would be reduced only about 15 percent making 4¾-day trips instead of 4-day trips.

By reason of the weight and space saved, a smaller vessel could be built to have equal passenger accommodations. A displacement of about 22,000 tons is suggested. This smaller vessel would be easier to handle and dock and could enter harbors that the larger vessel could not. The cost of the smaller vessel of 28 to 29 knots speed would be about 60 percent of the proposed vessel of 33 knots speed. The operating charges of the smaller and slower vessel, but with the same passenger carrying accommodations, would be materially less, probably about 25 percent, than the larger vessel.

As a naval auxiliary the extra 5 knots would not add very much value since the 29-knot speed is adequate for the particular services these vessels would be put to as naval auxiliaries, while the smaller and slower vessel would have a larger steaming radius and would require less personnel for its operation.

The 22,000-ton vessel of 28 to 29 knots might be a paying proposition, while the 35,000-ton vessel of 33 to 35 knots would probably have to operate at a loss.

As to Machinery

Three instead of four shafts would result in some saving of weight and space and would probably give some slight gain in propeller efficiency. Twin screw vessels might result in material savings in cost; with about 70,000 shaft horsepower this could be done. The use of as many as 16 boilers may well be questioned. This power, 160,000 horsepower, can be supplied by 12 boilers and the power for the 28-knot vessel could be furnished by 6 boilers of about 10,000 square feet of heating surface each.

The use of 400 pounds pressure and 250 degrees F. superheat will probably be justified on vessels that are expected to proceed at high power practically all the time. However special care must be exercised to take care of the steam at 700 degrees F. Reheating of the steam between the high pressure and low pressure turbine and the use of 3-stage feed heating also would give additional economy in steam consumption. While no mention is made in either editorial or notes concerning air heaters on the boilers, it is presumed that air heating would be applied, particularly in view of the high pressure that is to be used. Air heating would reduce the fuel consumption by several percent and would also reduce the uptake temperatures and incidental heating of adjacent living spaces in hot weather.

Terminals

The most desirable terminal on this side in order to secure the very fastest transatlantic trip would appear to be Boston. Boston already has excellent harbor equipment, proper docks, good railroad connections adjacent to the docks and also an air port close to its wharfs. Boston has dry docking facilities for these long vessels which other ports have not. The harbor is not congested and vessels could come in day or night.

The success of these vessels as an operating venture will depend upon whether a sufficient number of passengers can be found, the year around, who are willing to pay the extra fare for the specially fast passage.

Airplane connections appear very desirable and are quite feasible. These connections would enable people from the interior of the country to make very fast passages to places in Europe and return. This novelty would attract attention and should result in considerable patronage.

Value of Vessels as Naval Auxiliaries

These vessels would be of great value to the Navy in war time as scouting vessels and improvised airplane carriers. They could carry a limited number of airplanes and with these could increase the scouting area that they could cover. The presence of several of these fast liners ready to be turned over to the Navy in case of hostilities would replace the need for several cruisers. Hence this project would be of material assistance to our Navy.

CAPTAIN H. C. DINGER, U. S. N.

The Engine Room Personnel of the Leviathan

WHEN the *Leviathan* sailed from New York last month on her sixty-third round trip she carried a total of 1,084 officers and men in her crew, divided as follows:

Deck Department: Captain H. A. Cunningham, one staff captain, 14 licensed mates and a crew of 88, making all told 102.

Engineers' Department: J. J. Fagan, chief engineer; J. W. Rakow, staff chief; 43 licensed assistants, 3 juniors, 3 fan engineers, 3 hydraulic engineers, 3 deck engineers, 4 refrigerating engineers, 11 electricians, 6 plumbers, 6 machinists, 4 storekeepers, 2 yeomen, 30 oilers, 24 water tenders, 48 firemen, 20 wipers, 6 joiners, 6 painters, 2 upholsterers and 3 boiler makers, 228 all told.

Medical Department: Three doctors, 1 pharmacist, 2 nurses and 3 attendants.

Stewards' Department: The stewards' department has 700 all told, consisting of the chief steward, assistants, stewardesses, bellboys, waiters, cooks, butchers, bakers, printers, etc.

There are also 7 pursers, 2 pursers' clerks, 4 mail clerks, 3 baggage masters, 1 swimming instructress, 1 recreation director, an orchestra of 12, 1 food controller, 6 barbers, 2 hairdressers and 6 radio operators.

The engine room personnel is as follows:

Chief engineer: J. J. Fagan.
Staff chief: J. W. Rakow.
First assistant engineers: C. H. Isgar, M. P. Iverson, E. L. Dawson.
Second assistant engineers: I. F. Schlick, C. C. Clark, J. W. Thomas, K. M. Swimm, D. Coogan, C. Merry.
Senior third assistant engineers: P. J. Delahanty, J. Dondero, L. Hickey, N. Valencia, L. L. Nicholson, L. Kinsella, W. Fallon, J. A. Smith, R. Reber, J. J. Fay, W. Kaiser, G. Clow, G. Zercher, L. Verber, R. Wilkins.
Junior third assistant engineers: R. Hutchinson, A. Herlihy, F. J. Connolly, T. Young, C. Hudgins, C. Webber, I. H. Jones, E. Ritchie, J. W. Smith, F. W. Mahoney, J. P. Martin, F. Krosky, I. R. Bennett, F. Hart, R. McDavid.
Fourth assistant engineers: R. Gillis, G. L. Allen, J. J. Ward.
Junior engineers: W. Miller, W. J. Walker, J. DeBlaere.
Fan engineers: J. Nicholas, S. Perry, I. Anderson.
Hydraulic engineers: D. Conway, H. Ward, E. Harris.
Deck engineers: P. Olts, E. Askew, W. Baranauskas.
Refrigerating engineers: T. Mailander, chief; M. Swenson, 2nd; W. Gallop, 3rd; F. V. Padro, 4th.
Electricians: H. Fochs, chief; A. F. Neely, 2nd; T. E. Brown, 3rd; J. Fleming, 4th; H. L. Macy, 5th; O. Peinelt, 6th; J. Dillera, 7th.
Assistant electricians: J. Nevitt, J. Jackson, W. Dunn, F. Lyons.
Plumbers: A. W. Thomas, chief; R Wood, 2nd; J. E. Johnson, 3rd.
Assistant plumbers: : J. Waldron, M. Beattie, L. Green.
Chief machinist: P. C. Miller.
Chief storekeeper: J. Palmer.
Chief yeomen: E. L. Reiss; R. Yanez, 2nd.

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Personal

Sir Westcott Abell, K. B. E., has resigned as chief surveyor of **Lloyd's Register of Shipping** and established an office in London as a consultant.

C. L. Perkins, former general superintendent of the **Detroit and Cleveland Navigation Company,** Detroit, Mich., has been appointed assistant general manager. **George B. Wright,** assistant general superintendent, has been appointed general superintendent of the company and **William K. Muir** has been appointed superintendent.

J. Harry Mull has retired as president of **William Cramp and Sons' Ship and Engine Building Company,** Philadelphia, Pa., now in process of liquidation, and has been succeeded by **H. Birchard Taylor,** president of the **Cramp-Morris Industrials, Inc.,** which was formed to take over some of the departments and some subsidiaries of the Cramp Company when liquidation was decided upon more than a year ago.

H. B. Walker, who for the past year has been president of the **American Steamship Owners Association,** was re-elected at the recent meeting of the association held at 11 Broadway, New York. Other officers elected were: **Gale H. Carter,** president of the **Grace and Panama Mail Lines,** chairman; **H. W. Warley,** of the **Ore Steamship Company,** vice-chairman; **Ira A. Campbell,** general counsel; **R. J. Baker,** secretary-treasurer, and **Edwin H. Duff,** Washington representative.

Captain John F. Milliken, secretary-treasurer of the **Neptune Association,** New York, was recently presented with a silver loving cup by the members of the West Gulf Branch of the Neptune Association, situated at Galveston, Tex. Captain Milliken has been secretary of the association for the past six years and was recently re-elected for another year. He is also vice-president of the American Merchant Marine Library Association and a member of the executive committee of the American Marine Standards Committee.

James Montgomerie, D. Sc., has been appointed chief surveyor by the general committee of **Lloyd's Register of Shipping,** to succeed Sir Westcott Abell, who recently resigned. For some time past, Dr. Montgomerie has held the post of assistant to the chief ship surveyor and principal surveyor for Scotland. Dr. Montgomerie served his apprenticeship with the Messrs. William Denny at Dumbarton and at the Technical College. In 1897, at the examination of the board of education in naval architecture, he took first honors in the United Kingdom. He joined the staff of Lloyd's Register as a ship surveyor in 1901 and after a short service in the Glasgow office was transferred to the staff of the chief ship surveyor in London. While in London he obtained the degree of Bachelor of Science and in July, 1918, the degree of Doctor of Science was conferred upon him by London University for a thesis relating to the behavior of flat plates of shipbuilding quality when exposed in fluid pressure. In 1911, Dr. Montgomerie was selected for service in the New York office of the Society. He returned to England in 1914 and a year or two afterwards was appointed principal surveyor for Scotland. During the war he represented Lloyd's Register in the department of the controller general of merchant shipping. Shortly after the conclusion of the war, Dr. Montgomerie was appointed assistant to the chief ship surveyor, a position which he has held until the present time. In this capacity he was closely associated with the chief ship surveyor in the revision of the Society's rules for the construction and classification of steel ships in 1921, and the preparation of rules for oil tank vessels in 1925. Dr. Montgomerie in 1920 was awarded the gold medal of the Institution of Naval Architects for a paper on riveted joints.

Obituary

Byron E. Redmond, for 16 years marine engineer for the **Pittsburgh Steamship Company,** Cleveland, Ohio, died recently in the Marine Hospital, Cleveland.

Captain Israel J. Snow, president of the shipbuilding company which bears his name, died recently in Rockland, Me., at the age of 65. He was one of the best known of Maine shipbuilders. In 1903 he served as mayor of Rockland, Maine.

John V. Sheldon, for many years chief engineer of the Fall River Line steamer *Commonwealth,* died on January 27, 1928, at the Marine Hospital, Staten Island, New York. Mr. Sheldon was widely known on account of his practical knowledge and skill as a marine engineer. In 1918 he was drafted by the United States government to aid in the rehabilitation of the machinery of interned German freighters, whose crews wrecked the engines prior to leaving the vessels. He was in charge of the renovation of the freighter *Bohemian,* taking her across the seas on a trial trip, and then turning her over to the government. Practically all of Mr. Sheldon's experience was obtained with the Fall River Line, his previous post being that of engineer with the *Pilgrim,* the famous old-line steamer. He was with the *Commonwealth* from the time the keel of the ship was laid in Philadelphia, until two months ago, when he was transferred to the hospital.

John V. Sheldon

Mr. Sheldon was born on April 27, 1858, and entered the service of the New England Steamship Company in 1876. His advancement was steady until 1899 at which time he became chief engineer. This position was held until his recent illness.

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Ship Construction and Repair News

Proposed work—Bids asked—Bids received—Contracts awarded—Current activities

Shipping Board Places Contracts for Sixteen Auxiliary Diesel Engines

A CONTRACT for the construction of 4 auxiliary Diesel engines, which are to be used in the forthcoming program of converting 8 ships of the United States Shipping Board to Diesel drive, was recently awarded to the Fulton Iron Works, St. Louis, Mo., at a price of $107,232.07, and a contract for 12 engines to the Nordberg Manufacturing Company, Milwaukee, Wis., at a price of $426,840. Bids for the work were received and opened at the offices of Captain R. D. Gatewood, manager of the maintenance and repair division of the board, 45 Broadway, New York, on January 18.

DETAILS OF ENGINES

The 4 auxiliary Diesel engines, which are to be supplied by the Fulton Iron Works, are of the four-cycle, three cylinder type, having cylinder diameters of 17 inches, with a stroke of 24½ inches and will operate at 200 revolutions per minute. Each engine will drive a 150-kilowatt 240-volt generator, as well as an oversize compressor.

The 12 Nordberg engines, which are of the three-cylinder two-cycle type, have cylinder diameters of 16¾ inches, with a stroke of 22 inches and will operate at 225 revolutions per minute. These engines will drive 340 kilowatt, 240-volt generators. Each engine will be connected through a magnetic clutch to a maneuvering and emergency compressor having a delivery capacity of 550 cubic feet of free air per minute.

SUMMARY OF BIDS

For the information of members of the Shipping Board and others interested, an analysis of the various bids submitted was prepared by Captain Gatewood's staff and the award was made on the basis of this summary. For the benefit of our readers this summary is given below:

SUMMARY OF DIESEL ENGINE BIDS

Name	Make of Generator	4—150-KW. Engines Item No.	Price	12—350-KW. Engines Item No.	Price
Bethlehem	General Electric	2 and 3	$126,159.00	5 and 6	$568,052.00
Busch-Sulzer	Westinghouse	No Bid		4	590,184.00
Busch-Sulzer	Westinghouse	No Bid		4a	533,484.00
Busch-Sulzer	Westinghouse	No Bid		5 and 6	573,600.00
DeLa Vergne	Westinghouse	2 and 3	178,920.00	5 and 6	760,160.00
C. and G. Cooper	Westinghouse	2 and 3	112,332.70	No Bid	
Fulton Iron Works	Westinghouse	1	109,589.87	4	443,763.95
Fulton Iron Works	Westinghouse	2 and 3	126,822.35	5 and 6	493,463.05
Fulton Iron Works	Westinghouse	No Bid		7 and 8	495,163.95
McIntosh and Seymour	Westinghouse	1	156,639.80	4	650,942.40
McIntosh and Seymour	Westinghouse	2 and 3	172,618.70	5 and 6	719,114.10
New London	Westinghouse	No Bid		5 and 6	458,656.00
New London	Westinghouse	No Bid		5b and 6b	488,656.00
New London	Westinghouse	No Bid		5a and 6a	423,546.00
Nordberg	Westinghouse	No Bid		5 and 6	437,480.00
Worthington	Westinghouse	2 and 3	185,982.90	4	585,708.00
Worthington	Westinghouse	3a	223,790.74	5 and 6	589,862.70

Note: Ingersoll-Rand Company bid $740,822 for entire order of 16 engines. Fairbanks-Morse Company bid incomplete, no compressors included.

Panama Steamship Co. Issues Plans for Two Passenger Ships Bids To Be Opened March 17

PLANS and specifications were issued Wednesday, February 15, by the Panama Steamship Company, New York, for the construction of two passenger steamships. The firm of Cox and Stevens, naval architects, New York, prepared the designs and all details in connection with the proposed ships. Bids covering the work will be opened March 17, at the offices of T. H. Rossbottom, vice president of the Panama Steamship Company.

The specifications call for duplicate vessels each 510 feet length on the waterline, 63 feet molded beam, 32 feet molded depth to the main deck, and 41 feet 6 inches depth to the awning deck. The machinery for each vessel will consist of geared turbines, developing about 10,000 shaft horsepower. Steam will be supplied by 6 watertube boilers at 300 pounds per square inch pressure and 150 degrees superheat. The auxiliaries will be electrically driven and current will be supplied by Diesel engine generator sets. The ships will have a speed of 16 knots.

Accommodations for 350 passengers will be provided, special care having been taken to incorporate all of the changes in passenger arrangements that have developed from the design of such ships as the *Malolo*, *California* and others.

New Bids to Be Asked for New York Central Floating Equipment

REVISED specifications for the construction of 5 scows and 10 gasoline hoist barges for the New York Central Railroad are to be issued in about 10 days' time. Bids for these vessels were received in the offices of the purchasing agent of the New York Central Railroad, 466 Lexington avenue, New York, on January 14, but these tenders were rejected, as being too high.

Dravo Company Awarded Contract to Build 4 N. Y. C. Carfloats

A CONTRACT for the construction of four 270-foot steel carfloats has been awarded to the Dravo Contracting Company, Pittsburgh, Pa., by the New York Central Railroad at a price of $100,000 each, and 8½ months' time. Tenders for the work were received and opened at the offices of the purchasing agent of the New York Central Railroad, 466 Lexington avenue, New York, on Saturday, January 14.

Bids were also received at the same time for the construction of five scows and ten gasoline hoist barges, but these tenders were rejected. The low bid for the scows was $27,075 each and seven months' time, and for the gasoline hoist barges $32,850 each and eight months' time.

Shipping Board Asks Proposals on Six Diesel Engine Compressor Units

BIDS were received at the office of Captain R. D. Gatewood, manager of the maintenance and repair division of the United States Shipping Board Merchant Fleet Corporation, 45 Broadway, New York City, at 11:00 a. m., eastern standard time, February 29, 1928, and then publicly opened, for furnishing all or any part of 6 port and emergency air compressor units suitable for marine use.

The engines are to be of an approved type, suitable for driving 30 kilowatt, 240 volt direct current generators. They are to be of the vertical two or four cycle type, have preferably not less than three cylinders, short or medium stroke, medium speed, heavy duty, cold starting, trunk piston, non-reversible type, and thoroughly accessible, work on the full Diesel cycle, employ air or mechanical means for fuel atomization and have a closed water system for salt water cooling. When solid or mechanical injection engines are offered, they are to be guaranteed, burn the same low quality of fuel oil, be as flexible for varying grades of fuel and varying load conditions as the air injection type of equal size. It is strongly preferred that two-cycle engines have other than crank-case compression in order to insure efficient scavenging and conservation of lubricating oils. All types of engines are to be fully enclosed, fitted with attached forced feed lubrication pump and have attached centrifugal circulating water pump, the latter capable of lifting water 8 feet and discharge against 25 foot head.

At the aft end of the engine there is to be provided an emergency compressor

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of not less than 10 cubic feet capacity actual delivery (not piston displacement) connected by means of a flange coupling. This compressor may be Worthington, Rex, Winton, or equal, modified to suit specifications if necessary, having not less than three stages and capable of compressing up to 1,000 pounds gage pressure. Air and oil coolers are to be designed for 90 degrees F. sea water.

Each unit is to be furnished complete with all necessary accessories and mountings.

Unless otherwise specified the work is to be performed according to the rules and regulations of the American Bureau of Shipping, United States Steamboat Inspection Service and the Rules and Instructions for the Inspection of Marine Machinery built for the United States of America, as far as applicable.

Contracts Awarded to Westinghouse for Electrical Equipment on the Defiance and Triumph

CONTRACTS for the construction of electrical equipment for installation in the freighters *Defiance* and *Triumph*, which will be converted from steam to Diesel-electric drive, have been awarded to the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., by the United States Shipping Board. The *Defiance* will be converted at the Norfolk navy yard and the *Triumph* at the Boston navy yard.

The two vessels are to have their present 3,000 shaft-horsepower steam propelling machinery and auxiliaries removed and 4,000 shaft-horsepower Diesel electric propelling machinery with complete electric auxiliaries installed. This increase in horsepower and changes to be made in the bow and stern of the vessel are expected to give the freighters a speed of about 13 knots, as compared with their former speed of 10½ knots.

Pocahontas Coal Co. to Convert S.S. Jonancy to Burn Pulverized Coal

IT IS believed that the Newport News Shipbuilding and Drydock Company, Newport News, Va., is about to convert the steamship *Jonancy* to a pulverized coal burning vessel. The *Jonancy* is one of the Pocahontas Coal Company, New York, vessels.

Boiler Contract for Pilot Boat New York Awarded

A CONTRACT for furnishing and installing a boiler in the pilot boat *New York*, owned and operated by the United New York Sandy Hook Pilot's Association, Inc., 17 Whitehall street, New York, has been awarded to the Morse Drydock and Repair Company, Brooklyn, New York. Bids for the work were received at New York recently with the following results:

Name	Furnish Boiler	Time	Install Boiler	Time
Morse Drydock and Repair Company	$14,000	4 months	$7,500	20 C. R. D.
Kingston Drydock and Construction Company	15,348	10-12 weeks		
John W. Sullivan Company	16,772	.....	6,392	20 C. R. D.
Robins Drydock and Repair Company	16,778	12 weeks	7,815	16 C. R. D.
Tietjen and Lang Drydock Company	17,400	14 weeks	7,200	14 C. R. D.
Staten Island Shipbuilding Company	16,100	3½-4 months	8,600	3 weeks
Tebo Yacht Basin Company	16,000	10-12 weeks	10,231	16 C. R. D.

Export Line Proposes Construction of Three Ships If Mail Contracts Are Assured

INFORMATION has been received that the Export Steamship Corporation, New York, operators of the American Export Line, will construct three 18-knot passenger and cargo vessels for its New York-Mediterranean trade, provided the corporation is assured of a long term mail carrying contract and a loan from the construction loan fund of the United States Shipping Board. The plan was announced in a telegram sent to the Shipping Board by Henry Herbermann, president of the Export Corporation.

Pacific Coast Firm Purchases Shipping Board Vessels

IT IS reported that the Pacific Coast Engineering Company, Seattle, Washington, has purchased the steamships *Eastern Coast* and *Eastern Guide* from the United States Shipping Board.

About a year ago the firm of Frank S. Martin and Son, naval architects, 25 Broadway, New York City, prepared plans and specifications covering the reconditioning and altering of the two vessels. It is understood that within a short time the work of repairing both these ships and the installation of hoppers for carrying limestone will be undertaken. The work will be in charge of Frank S. Martin and Son.

Contract for Steel Hull Awarded Riter-Conley Co.

A CONTRACT for the construction and delivery, f.o.b. builder's shipyard, of one steel hull has been awarded to the Riter-Conley Company, Pittsburgh, Pa., by the Mississippi River Commission First and Second Districts, Memphis, Tenn. Tenders for the work were received recently with the following results:

Name	Price	Days
Riter-Conley Company	$34,700	100
Dubuque Boat & Boiler Company	36,000	140
St. Louis Structural Steel Company	36,800	180
Howard Shipyards and Dock Company	37,000	150
Dravo Contracting Company	37,730	115
Alabama Drydock and Shipbuilding Company	37,800	160
Nashville Bridge Company	37,900	130
Midland Barge Company	39,000	100
Mid-West Boat and Barge Company	43,200	210
Marietta Manufacturing Company	45,000	150
Charles Hegewald Company	46,900	240
Zier Boiler and Sheet Iron Company	66,600	210

Bids Asked for 35 Steel Barges

THE Mississippi River Commission, First and Second Districts, Memphis, Tenn,. will receive sealed proposals until 11:00 A. M., March 3, 1928, for the construction and delivery, f.o.b. bidder's shipyard, of 35 steel barges. Additional information may be obtained upon application.

Charles Ward Co. to Build U. S. Engineer Tug

A CONTRACT for the construction of one steel tug for the United States Engineer Office, Galveston, Texas, has been awarded to the Charles Ward Engineering Works, South Side, Charleston, W. Va., with Winton engine, at a price of $44,000, or Bessemer engine, at $47,760.

The tug will have a length of 65 feet 6 inches; length between perpendiculars 61 feet 8 inches; breadth, molded, 17 feet; draft, mean (about) 6 feet, and depth, molded, 7 feet 7½ inches. Bids for the work were received at Galveston on December 17, last.

Tugboat to Be Equipped to Burn Pulverized Coal

THE Flannery Towing Line, Inc., 15 Moore street, New York, is planning the installation of pulverized coal burning equipment in the towboat *James H. Flannery*. The company has one Diesel-engined craft now in operation, the *Walnero No. 4*. The other vessels in the fleet are hand fired coal burners. With the new installation in operation, a direct comparison of the advantages of each type of fuel burning can be gained.

One Kennedy marine type air-swept tube pulverizer will be used, firing one Heipershausen boiler that is already in the ship. In addition, one Kennedy-Van Saun feeder piping and burner will be used. The work is to be done at the plant of the Metropolitan Boat Repairs Corporation, New York.

Bids Rejected for Tug John C. Irwin

THE tenders received by the United States Engineer Office, Nashville, Tenn., a short time ago, for furnishing all labor and materials and performing all work for providing and installing new machinery on the towboat *John C. Irwin*, have been rejected.

The Nashville Bridge Company, Nashville, Tenn., submitted three prices as follows: For installation of a Winton engine, $34,900; Fairbanks engine, $35,100, or Standard engine $37,400 (less $200 allowed for old machinery). One other bid was received from the firm of John Bouchard and Sons Company, Nashville, Tenn., who submitted a price of $37,500 for the installation of a Winton engine, less $600 for old machinery. It is expected that new bids will be called for shortly.

Steel Barges Contemplated by U. S. Engineers

THE United States Engineer Office, Huntington, W. Va., is planning the construction of a number of steel barges. Further details will be available shortly.

S.S. City of Los Angeles Repairs

THE 12,642 gross-ton steamship *City of Los Angeles*, owned and operted by the Los Angeles Steamship Company, Wilmington, Calif., has been drydocked at San Pedro for hull cleaning, painting and minor repairs. The work will represent an expenditure of $30,000.

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Bids Asked for Two Mooring Barges

SEALED proposals will be received by the Third Mississippi River District, Box 404, Vicksburg, Miss., until 11:00 a. m. March 6, 1928, and then opened, for constructing two steel hull mooring barges and delivering them at Vicksburg, Miss. Further information may be obtained upon application.

Charles Ward Gets Contract for Maneuver Boats

THE United States Engineer Office, Pittsburgh, Pa., has awarded a contract to the Charles Ward Engineering Works, South Side, Charleston, W. Va., for the construction of two steel maneuver boats. Bids for the work were received at Pittsburgh on January 19, 1928. The price involved was not given out.

Pontoon Contract Awarded

THE District Engineer, Mississippi River Dredging District, Box 1017, Memphis, Tenn., has awarded a contract for the construction of 80 steel pontoons to the Mississippi Valley Structural Steel Company, St. Louis, Mo., at a price of $32,000 and a time of 150 days. Thirty-two tenders were submitted on January 3, ranging from $32,000 to $142,400.

Contract for 20 Steel Pontoons Awarded

THE United States Engineer Office, 1068 Navy building, Washington, D. C., has awarded a contract to the Witt Humphrey Steel Company, Greensburg, Pa., for the construction of 20 steel pontoons, at a price of $8,489 and 60 days' time. The pontoons are to have a length, molded, 21 feet 2½ inches; breadth, molded, 7 feet; depth at gunwale 3 feet, and length of rake 3 feet 6½ inches.

Robins Yard to Carry Out Extensive Repairs on S.S. Albisola

A contract covering grounding damage to the Italian steamship *Albisola* has been awarded to the Robins Drydock and Repair Company, Brooklyn, N. Y., at a price of $36,764 and a time of 21 continuous running days. Several prices were submitted on a number of miscellaneous items which were not figured in the total.

Plans and specifications for the work were prepared and sent out by the firm of Frank S. Martin and Son, naval architects, New York. Specifications call for the installation of 38 new plates, the removal of 33 plates, straightening and fairing and their replacement. A great many other plates, frames, floors and the like required straightening in place. The stem has been bent and part of it will have to be removed, faired and replaced.

In addition to the hull damage, a considerable amount of machinery repairs will be necessary.

Construction and Repair Bids

Standard Oil Company of California Opens Bids for New Tanker—Low Bid $1,625,000

TENDERS were received and opened a short time ago, at the offices of the Standard Oil Company of California, San Francisco, California, for the construction of a 13,000-ton Diesel-electric tanker. The machinery, which will go into the new tanker, was intended for installation in the tanker *District of Columbia* purchased about a year ago from the United States Shipping Board. The cost of converting this ship was found to be excessive and the Standard Oil Company decided to abandon this change and build a new vessel. The proposals received for the work were as follows:

Name	Price	Days
Newport News Shipbuilding and Drydock Company	$1,625,000	420
Sun Shipbuilding and Drydock Company	1,687,000	300
Bethlehem Shipbuilding Corporation, Ltd.	1,739,000	499
Moore Drydock Company	1,875,000	15 (months)
Los Angeles Shipbuilding and Drydock Corporation	1,896,000	390
American Brown Boveri Electric Corporation	1,925,000	480

Norfolk Ferry Bids Received

PROPOSALS were received on February 17, by Charles U. Freund, manager of the construction department of the Norfolk County Ferries, Portsmouth, Va., covering the construction of two 400-horsepower Diesel engines, operating directly one 250-volt generator each, giving a maximum potential power of 500 volts to the motor operating the fore and aft propellers, for installation in a new ferryboat. No decision for the award has as yet been reached.

Bids for the electric machinery for this ferryboat were previously received. Tenders for the hull will be asked as soon as preliminary work has been completed.

The ferryboat is to be a steel double end boat, single deck, having four driveways, with a capacity of over 40 vehicles. There are to be two passenger cabins, 175 feet by 58 feet overall. The vessel is to have a speed of 12½ miles per hour. It is expected that 8 or 9 months will be required for the construction of the ferryboat. Eads Johnson, consulting engineer, 115 Broadway, New York, prepared the plans and specifications for the new boat.

Oertz Rudder Orders

THE Oertz Streamline Rudder Corporation of 75 West street, New York City, has announced that during the month of January orders for Oertz rudders were received for 21 more ships, aggregating 78,000 tons deadweight, bringing up the total to 265 vessels, aggregating 1,364,000 tons deadweight booked in less than three years' time.

Long Island R. R. Receives Bids for Diesel Electric Tugboat and for Carfloat

BIDS were opened at the offices of the Long Island Railroad, New York, recently, for the construction of a Diesel electric tugboat and a carfloat, having a capacity of 21 cars. Plans and specifications for the work were prepared by Eads Johnson, naval architect, 115 Broadway, New York.

The tugboat is to be built of steel throughout with a steel deck, steel house and pilot house. The hull is divided by watertight bulkheads at each end, forming fore and aft peak tanks. The general details of the boat are as follows: Length overall 109 feet; length between perpendiculars 96 feet; beam overall 24 feet 9 inches; beam, molded, 24 feet 6 inches, and depth, molded, 14 feet.

The propelling machinery will consist of two full Diesel engines, each of 500 brake horsepower. Each engine will drive a 335-kilowatt generator at 230 revolutions per minute, as well as a 30-kilowatt exciter, these generators will supply current to a double armature type propelling motor of 825 shaft horsepower, operating at 100 revolutions per minute.

The machinery will also include a compressor set consisting of a Diesel engine driving a generator, a fire and blige pump and a compressor. This engine will have sufficient power to operate the pump and generator simultaneously.

The carfloat on which bids were also received will have a length of 332 feet, a beam of 41 feet 9 inches and a depth of 11 feet. As noted above, it will have a capacity for 24 cars on 3 tracks.

The bids submitted were not available for publication at the time of going to press, but further information covering the work will be released later.

Tenders Received for Building Steel Dredge

TENDERS were received and opened by the United States Engineer Office, Schaff building, 1505 Race street, Philadelphia, Pa., recently for furnishing and delivering one hydraulic dredge. The dredge is to be of steel construction, 5 feet freeboard and capable of dredging 45 feet deep. It is to be equipped with fuel tanks to hold 8 days supply of oil, working 24 hours per day; a 20-inch centrifugal pump, ladder 70 feet long, and quarters for 50 men. The following proposals were received:

Name	Price	Boilers	Dredging Depth (feet)
New Jersey Shipbuilding and Dredging Company, New York, N. Y.	$239,000	Watertube	45
Arundel Corporation, Baltimore, Md.	250,000	Babcock & Wilcox	40
Ellicott Machine Corporation, Baltimore, Md.	369,000	Babcock & Wilcox	50
National Dredging Company, Duluth, Minn.	426,000	Scotch Marine	40

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Todd Drydocks Submit Lowest Bid on S.S. Iroquois

WITH a price of approximately $208,000, the Todd Drydocks, Inc., Seattle, Wash., submitted the lowest bid for converting the steamship *Iroquois* of the Puget Sound Navigation Company, Seattle, into a ferryboat for operation between Seattle and Victoria, B. C. Four firms submitted tenders which ranged as high at $230,000.

The plans which were prepared by Lee and Brinton, Seattle naval architects, call for the entire rebuilding of the vessel. The present deck of the *Iroquois* is to be raised and the ship widened from 36 to 48 feet. A new main deck and new staterooms will be constructed. The plans include new machinery and boilers, which will be installed by the owners. The award has not as yet been made.

Tenders for S.S. Scottsburg Repairs Opened

ON February 20, 1928, tenders were received at the New York office of the United States Shipping Board covering repairs to the steamship *Scottsburg,* with the following results:

Name	Price
Robins Drydock and Repair Company	$17,410
W. and A. Fletcher Company	18,600
New York Harbor Drydock Company, Inc.	19,500
Morse Drydock and Repair Company	20,872
Federal Shipbuilding Company	21,091
James Shewan and Sons, Inc.	23,649
Theodore A. Crane's Sons Company	23,749
Staten Island Shipbuilding Company	24,504

Staten Island Co. Low Bidder for Ferryboat Repairs

WITH a price of $7,900, the Staten Island Shipbuilding Company, Staten Island, New York, submitted the lowest proposal covering repairs to the ferryboat *Atlantic* of the New York Department of Plant and Structures, bids for which were received recently. Five other bids were received as follows:

Name	Price
Morse Drydock and Repair Company	$ 8,500
John W. Sullivan Company	10,338
Ira S. Bushey and Sons, Inc.	10,470
Todd Shipyards Corporation	10,534
James Shewan and Sons, Inc.	12,900

Repair Bids Received for S.S. Commodore Rollins

HERVIK AND BEYLEGAARD, marine surveyors, 59 Pearl street, New York, received tenders recently, covering repairs to the steamship *Commodore Rollins,* with the following result:

Name	Item 1	C.R. Days	Item 2	C.R. Days
New York Harbor Drydock Company, Inc.	$ 7,167	12	$5,887	14
Morse Drydock and Repair Company	8,636	12	7,129	18
W. and A. Fletcher Company	8,883	13	5,807	16
Robins Drydock and Repair Company	9,168	16	10,055	16
James Shewan and Sons, Inc.	10,520	18	5,874	18
Tietjen and Lang Drydock Company	10,560	17	11,000	17
Staten Island Shipbuilding Company	11,168	16	9,602	16
Todd Shipyards Corporation	11,275	17	11,990	17

Todd Drydocks, Inc., Bids Low on S.S. Northwestern Repairs

WITH a price of approximately $160,000, the Todd Drydocks, Inc., Seattle, Wash., submitted the lowest tender for repairs to the Alaska Steamship Company's liner *Northwestern,* and has been awarded the contract. After temporary repairs are made to the liner in the Burrard Drydock, she will leave for Seattle.

The *Northwestern* went ashore on December 11 in a blinding snowstorm off Cape Mudge, British Columbia while bound from Seattle for southern Alaska.

Bids Received for Dredge Fort Chartres Boilers

TWO tenders were received on February 15, 1928, by Major John C. Gotwals, Corps of Engineers, Room 428 Customhouse, St. Louis, Mo., for repairing and installing new boilers, economizers, etc., on the United States dredge *Fort Chartres.* The Howard Shipyards and Dock Company, Jeffersonville, Ind., submitted a price of $111,566, and the Ayer and Lord Tie Company, Chicago, Ill., a price of $147,346. A contract for the work has not as yet been awarded.

Morse Drydock Co. Gets Contract for S.S. Sagadahoc Repairs

THE Argonaut Steamship Line, 26 Beaver street, New York City, has awarded a contract to the Morse Drydock and Repair Company, Brooklyn, New York, covering repairs to the steamship *Sagadahoc.* Bids for the work were received at the New York offices of the Argonaut Line recently and are as follows:

Name	Price	C.R.D.
Morse Drydock and Repair Company	$10,616	13
Tietjen and Lang Drydock Company	11,595	16
Staten Island Shipbuilding Company	13,148	10
James Shewan and Sons, Inc.	14,197	23
W. and A. Fletcher Company	14,265	12
Theodore A. Crane's Sons Company	15,543	16

Fletcher Yard Submits Low Bid on Tugboat Nanuet Repairs

WITH a price of $16,300 and a time of 20 continuous running days, the W. and A. Fletcher Company, Hoboken, N. J., submitted the lowest proposal covering repairs to the Erie Railroad Company tug *Nanuet.* Bids for the work were received at the New York offices of the Erie Railroad on February 14. Other tenders received include the following:

Name	Price	C.R.D.
Frank McWilliams, Inc.	$16,800	30
James Shewan and Sons, Inc.	16,900	28
Tietjen and Lang Drydock Company	18,418	30
Theodore A. Crane's Sons Company	19,267	28
Todd Shipyards Corporation	19,573	30
John W. Sullivan Company	19,850	40
Union Drydock and Repair Company	20,940	39
Morse Drydock and Repair Company	21,995	27
Brewer Drydock Company	21,975	37
Staten Island Shipbuilding Company	30,395	35
Ira S. Bushey and Sons	39,998	102

Kensington Plant Sold to Philadelphia Company

INFORMATION has been received that the Kensington plant of the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Pa., has been sold to Francis J. McDonald, president of the Philadelphia Ship Repair Company, Philadelphia, Pa. The Kensington plant is located about a quarter of a mile from the main Cramp shipyard. Terms of the sale were private.

President Coolidge Favors Four Day Liner Plan

IT HAS BEEN learned that President Coolidge favors the plan for the construction of a fleet of 35,000-ton, four-day trans-Atlantic liners recently submitted to him personally by Laurence R. Wilder, president of the Trans-Oceanic Corporation and Captain Herbert Hartley, chief of the operating division of this line, although he has not gone so far as officially to indorse the proposal. He believes that four-day liners, constructed along the general lines of airplane carriers and transporting planes for passengers and mail within striking distance of land, will bear careful investigation by the government, as they may well contribute to national defense and the general welfare of the country on the seas.

The President believes that the government may be able to extend reasonable assistance in the building of these ships on this ground and especially in view of the construction loan asked being but three-fourths of the cost, whereas the law provides that the government may furnish credits up to two-thirds of the total building expense.

The Trans-Oceanic Corporation, which placed its four-day liner proposal before the Shipping Board some time ago, has also assured the government that it merits credit because of $50,000,000 of additional working capital already available.

Shipping Board Offers Two Atlantic Services for Sale

ANNOUNCEMENT was recently made by the United States Shipping Board that the combination passenger and cargo ships of the American Merchant Lines and also those of the West African Line will be offered for sale. The board has given instructions for advertisements for bids to be prepared and submitted. Five vessels of the American Merchant Lines are to be sold and seven of the West African Line.

In this connection it has been decided that when the combination vessels of the American Merchant Lines have been sold the cargo ships of that line will be sold or allocated for service from Norfolk. Members of the board stated that it had not been settled who or what interests would operate the cargo ships from Norfolk.

The decision of the Shipping Board is in harmony with its policy to get rid of the government shipping as rapidly as practicable. In the face of protests from some of the members of the Senate Commerce Commission, the board recently arranged for the sale of virtually all the remaining government shipping on the Pacific that plied between the West Coast and the Orient.

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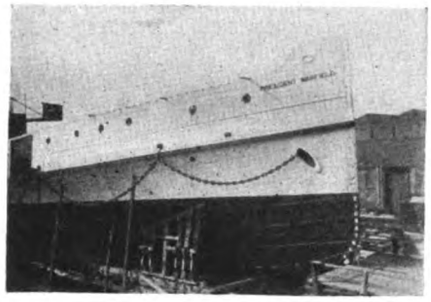
Steamer President Warfield Launched

THE steamer *President Warfield*, under construction at the yard of the Pusey and Jones Corporation, Wilmington, Del., to the order of the Baltimore Steam Packet Company was



S. S. President Warfield

launched on February 6. The vessel, which is to be delivered about June 1, has a length of 330 feet and is similar to the boats of the line now in service between Baltimore and Norfolk.

New Orleans Prepared to Increase Barge Line Terminal Facilities

THE Board of Commissioners of the Port of New Orleans have indicated great interest in the recent report of Mr. Norman F. Titus to the Secretary of War, and have announced that they are prepared to increase their freight handling equipment and to improve berthing facilities to any extent that may be needed to give proper accommodation in case of maximum development of barge line movement on the river.

Mr. Titus, whose report has not been made public, has revealed that there are available from river ports, plus Chicago, nearly 7,000,000 tons per annum for barge line transportation, as compared with the barge line present capacity of something more than 1,000,000 tons. Shippers and receivers in New Orleans were generally gratified at this information, which was considered surprising only in the fact that the figures do not include freight available on joint rates from other than river points—with the one exception of Chicago. They believe that the analysis of the complete survey will bring about favorable action by Congress in the matter of providing additional capitalization for expansion of carrying facilities.

* * *

Frank C. Munson, president of the Munson Steamship Line, making a contribution to the sailors' library

This huge "book" in the Pennsylvania Railroad station, New York, is the unique metnod used by the Merchant Marine Library Association to appeal to the public for the donation of books for the floating library. The giant book itself is the gift of W. W. Atterbury, president of the Pennsylvania Railroad.

Lake Carriers Association Holds Annual Dinner

GREATER economies in operation of the Great Lakes fleets were predicted by L. C. Sabin, vice president of the Lake Carriers' Association, at the 12th annual dinner given recently by the organization to the graduates in the Engineering and Navigation School, sponsored by the Lake Carriers at Cleveland, Ohio.

Mr. Sabin stated that the vessel industry has not kept pace with other industrial activities in effecting economies of operation, although some of these defects will be corrected in the near future. Among those that will be put in operation as time goes on, he further stated, will be a wider use of the radio compass, the gyro compass and fuel saving devices.

George A. Marr, secretary of the association, was toastmaster, and other speakers included: Dr. M. R. Shie of the Marine Hospital staff; David Gaehr, principal of the engineering department; Captain R. W. England and United States Inspectors Silas Hunter and Thomas W. Gould.

Lindbergh Again Flies the Mail

THE following letter, which was recently received by MARINE ENGINEERING AND SHIPPING AGE from the Haskelite Manufacturing Corporation, Chicago, Ill., was carried by Col. Charles A. Lindbergh on February 21 by air mail from Chicago to St. Louis. Advantage was taken of this opportunity by many industrial concerns to advance the cause of the air mail which is rapidly becoming an important factor in the speedy transaction of business in this country.

Marine Engineering and Shipping Age,
c/o Grayson Railway Supply Co.,
600 LaSalle Building,
St. Louis, Mo.

Attention: *Editorial Department*

Gentlemen:

We believe you will find this letter of historic value because it is being carried to you by Col. Charles A. Lindbergh, who is operating the Chicago-St. Louis Air Mail for two days.

This company for some time has made extensive use of air mail for the double purpose of hastening its mail and co-operating with the various air mail lines.

Last July we had a special letterhead and envelope made for this purpose. You will note that this letterhead and envelope are printed on very thin paper so that a two-page letter, stamped and sealed in its envelope, weighs less than one-half ounce and comes within the air mail postage rate of $.10 a half ounce.

We believe all business houses should patronize the air mail service.

Yours very truly,

HASKELITE MFG. CORP.,
James R. Fitzpatrick,
Vice-President and Secretary.

P. S.—The plywood in the plane in which this letter was carried is HASKELITE, as practically all the plywood used in the construction of the "Spirit of St. Louis" is HASKELITE.

Wilson Transit Company Retains Fleet Engineers

THERE will be no change in the chief engineers on the vessels of the Wilson Transit Company, Cleveland, Ohio, for the season of 1928, Captain J. S. Wood, vice president, recently announced in making known the men appointed. Those appointed and the vessels they will sail are as follows:

Vessel	Chief Engineer
Wm. C. Atwater	Hans T. Meyers
James McNaughton	George E. Willard
Gen. Garretson	Edmund Landry
H. P. McIntosh	William McKenzie
J. E. Upson	H. S. Wixson
Charles E. Hebard	J. C. Reynolds
Frank E. Taplin	Edward Clark
S. H. Robbins	H. F. Bangs
Capt. Thomas Wilson	F. J. Heagerty
A. W. Osborne	Swan Swanson
W. D. Rees	Alfred Henry

Chief Engineers for Pittsburgh S. S. Co. Vessels

APPOINTMENT of chief engineers who will command the fleet of the Pittsburgh Steamship Company, Cleveland, Ohio, for the coming shipping season, were recently announced and are as follows:

Vessel	Chief Engineer
Affleck	F. Thurman
Harvey	G. L. Barnhart
Hatfield	W. P. Diamond
Lindabury	R. W. Townsend
Clemson	H. M. Lubahn
Kerr	A. E. Buddemeyer
McGonagle	H. Edmondson
Pargny	Wm. Bourlier
Williams	H. E. McIntosh
Ziesing	F. Schwartz
Farrell	C. S. McIntyre
Roberts Jr.	H. F. Schroeder
Trimble	Wm. Dornbrook
Crawford	W. C. McDougall
Filbert	J. V. Cole
House	W. A. Marshall
Dickson	J. Hasler
Olcott	W. B. Danforth
Palmer	C. A. Suttle
Buffington	R. H. Richmond
Dinkey	H. W. Endelman
Morgan Jr	B. Henry
Schiller	M. F. Sweeney
Baker	W. A. Lewis
Cole	L. Haggan
Lynch	G. D. Johnson
Phipps	E. J. Rae
Morgan	H. Gunderson
Ream	W. G. Staley
Rogers	G. R. Emrey
Widener	J. B. Woods
Corey	A. C. Lowe
Frick	J. D. Walker
Gary	Wm. Culp
Perkins	F. Limpert
Edenborn	W. T. Welsh
Ellwood	A. Hasler
Gates	W. Churchill
Hill	C. D. Reno
Poe	C. V. Annable
Morse	J. T. Schei
Houghton	W. Oehlenschlager
Cornell	C. E. Timleck
Harvard	J. B. Kettell
Princeton	C. Sahlen
Rensselaer	T. A. Ives
Malietoa	J. Friesenhan
Bunsen	Wm. Sills
Murphy	H. G. Rood
Shaw	P. F. McDonnell
Mataafa	C. S. McElroy
Maunaloa	E. Oehlenschlager
Black	E. L. Moulton
Collins	A. P. Truelsen
Ferbert	H. Grotemat
McLean	C. H. Savage
Mitchell	F. J. Manion
Richardson	H. N. Armstrong
Shiras	W. R. Miller
McDougall	D. Bourlier
Fairbairn	C. C. Rector
Fulton	W. F. Parker
Bessemer	K. Brake
Siemens	T. Reinert
Stephenson	F. J. Goller
Watt	F. Leng
Maricopa	H. O. Armstrong
Linn	P. Christensen
Queen City	E. R. Rattray
Zenith City	L. E. Darling
Maritana	J. R. Jones
Mariposa	H. Lickfeldt

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Chief Engineers Appointed for the Interlake Fleet

CHIEF Engineers for the Interlake Steamship Company, Cleveland, O., fleet for the shipping season of 1928 have been officially announced. The company operates the second largest fleet on the Great Lakes, consisting of 45 vessels. The official list of the engineers is as follows:

Vessel	Chief Engineer
Harry Coulby	James Brand
Robert Hobson	W. D. Woods
Wm. McLauchlan	William Anderson
Harry G. Dalton	H. H. Kessel
Samuel Mather	F. C. La Londe
Col. Jas. Pickands	J. J. Ward
Chas. M. Schwab	Hugo Dietlin
D. O. Mills	N. G. Lockhart
Jay C. Morse	J. P. Fetting
Pathfinder	G. A. Brown
J. A. Campbell	Elmer Zoble
E. A. S. Clarke	James Dungan
C. H. McCullough	John Carr
James C. Wallace	J. L. Martin
Augustus B. Wolvin	Fred Werner
C. S. Robinson	A. J. Hoffman
Joseph Sellwood	Charles Shields
Amasa Stone	H. A. Woods
Arcturus	Leo Arnold
John Sherwin	Otto Elsholz
Youngstown	F. J. Hiller
Crete	Ed. Vollstoedt
Verona	John Cannon
Canopus	E. M. Tims
Perseus	Thomas Miller
Harry R. Jones	L. M. Richardson
James H. Reed	R. H. Beauchamp
Adriatic	William Burnett
Calumet	Emil Feix
William B. Davock	J. Johnson
Elba	Mike Driscoll
Hemlock	J. E. Vigneron
Odanah	Albert Jacobi
Vega	J. J. Keller
Victory	R. H. Folkert
Cetus	J. J. Higgins
Corvus	Chester Bell
Cygnus	William Schunk
Pegasus	Sam Sanderson
Saturn	Ray Arnold
Taurus	John Seymour
Jupiter	T. W. Johnston
Neptune	Sam Emerson
Venus	L. Goulette
Lagonda	M. Frye

Atlantic Coast Safety Committee Formed

AT a dinner of the executive committee of the Marine Section of the National Safety Council, held at the New York Athletic Club, New York City, on the evening of February 20, Norman F. Titus, chief of the transportation division, Department of Commerce, Washington, D. C., outlined the safety movement recently inaugurated on the Atlantic coast as the outgrowth of a joint safety meeting held in New York on February 6 by the Terminal Engineers Society and Materials Handling Section of the American Society of Mechanical Engineers. An Atlantic coast Safety Committee of 12 has been appointed to survey conditions and recommend methods of reducing the number of accidents in Atlantic harbors. Steps have already been taken to secure the services of an engineer to make a survey of conditions in New York harbor and recommend ways and means of eliminating preventable hazards in handling cargoes at the water front.

This movement follows closely on the heels of successful work in this direction on the Pacific coast where in Seattle harbor alone accidents were reduced over 60 percent in six months. In San Francisco similar results are being obtained and Pacific coast shipowners are united in promoting this beneficial movement at all Pacific ports.

Mr. Titus warned his hearers that if the shipowners on the Atlantic coast do not undertake this work themselves the Government under section 41 of the Workers' Compensation Act will legislate on safety and place another unwelcome burden on shipping. He urged shipping men to get behind this great humanitarian movement and cooperate financially and otherwise in securing results.

Other speakers at the meeting were Homer E. Niesz, president of the National Safety Council, and W. H. Cameron, its managing director, who outlined the growth of the National Safety Council and pointed out the benefits derived from its work. A. R. Bush of the Barber Asphalt Company, chairman of the Marine Section, presided at the meeting.

Large Dry Dock Needed in New York Harbor

THE need, proper location and the financial feasibility of a dry dock of sufficient size to accommodate the largest ocean steamship at the Port of New York, were enumerated in a report submitted to the Legislature of New Jersey on February 20 by the Port of New York Authority in response to the former's recent request for such a survey.

The necessity for the proposed facility had been established in the short time allowed for the inquiry, the Port Authority said. A location on the New Jersey side of the Hudson River, with sites available at Bayonne, Jersey City, Weehawken and North Bergen was found most desirable.

WOULD COST OVER $10,000,000

Construction of the dry dock should be financed with public funds, it was declared, but operating arrangements were suggested that would prevent competition with private enterprise. The cost was estimated as between $10,000,000 and $12,000,000, depending on type of dock foundation, conditions at site and amount of dredging.

Doubt was expressed if a big dry dock would pay as a mere commercial proposition. Methods were outlined, however, whereby revenues to meet capital charges might be secured in whole or in part and it was mentioned that as a matter of port policy, the Port of New York should not be allowed to remain behind the other ports of the world in its port equipment.

SHIPOWNERS FAVOR PROJECT

It is believed that guarantees or subsidies might be paid by steamship companies to the annual cost of a large dry dock and that the Navy Department or the United States Shipping Board or both might agree to do the same thing.

"The representatives of all of the foreign lines operating the largest ships," the Port Authority report declared, "have expressed a desire for a dry dock in this port capable of taking their vessels but have admitted that they would probably use it only in emergencies. There was some indication that because of this great need, it might be reasonable to request these lines to contribute annual payments to insure having such an emergency facility available but no commitments were made and this matter would require negotiation."

It was shown that there are fifteen large vessels entering the port with more planned and under construction which cannot be dry docked at existing commercial facilities.

The Isherwood System of Ship Construction

THE twentieth year of activity for the Isherwood system marks an epoch in ship construction development inasmuch as this year's return shows still more remarkable progress in the adoption of the "bracketless-system" (which is really an improved Isherwood system) than the year 1926—actually the year of its introduction. At the end of 1926, there were built and contracted for on the new system, 14 vessels aggregating 180,000 tons deadweight carrying capacity, which at the close of 1927 has increased to 41 vessels representing 412,000 tons deadweight and with the ships placed on the pure Isherwood system a total of 67 vessels has been contracted for in the year.

The above figures provide ample evidence of the confidence and popularity

Officers and members of the executive committee of the Marine Section of the National Safety Council

Left to right: John S. Hunter, Atlantic Refining Company; W. P. Kain, Shipowners' Claims Bureau, Inc.; J. J. Farrell, The Travelers Insurance Company; G. Bartlett, Cosmopolitan Shipping Company; Eugene Moran, Jr., Moran Towing and Transportation Company; J. Wright, Export Steamship Company; W. E. Welch, The Travelers Insurance Company, secretary; A. R. Bush, The Barber Asphalt Company, chairman; Arthur M. Tede, The Texas Company, vice-chairman; Fern Wood, Williams Steamship Company; Reginald Fay, New York Central Lines; I. L. Evans, U. S. P. & I. Agency, Inc.; R. F. Hand, Standard Shipping Company, and Ellis Knowles, C. D. Mallory & Company.

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the "bracketless-system" is gaining, and this is accounted for not only by the great advantages it has in itself to offer, but by the "backing" secured in the knowledge that the system originates from one so widely adopted in the past —proof of which is contained in the following table showing the number of ships —with the corresponding deadweight carrying capacity—contracted for in each year since 1907:

Year	Number of ships built or under construction	Deadweight carrying capacity, tons
Sept., 1907, to Dec., 1908	6	31,608
1909	36	212,922
1910	76	484,752
1911	140	658,795
1912	240	1,777,348
1913	270	1,993,034
1914	311	2,351,322
1915	468	3,548,221
1916	620	4,666,000
1917	800	6,332,150
1918	1,050	8,707,700
1919	1,260	10,594,700
1920	1,395	11,962,400
1921	1,418	12,032,400
1922	1,431	12,101,890
1923	1,443	12,174,490
1924	1,472	12,408,700
1925	1,502	12,649,730
1926	1,551	13,096,480
1927	1,618	13,491,380

TRADE PUBLICATIONS

Recording Wattmeters.—The Bristol Company of Waterbury, Conn., has issued a catalogue in which devices intended to furnish continuous records of load power and lighting circuits in terms of watts are described.

Telindicator Instrument.—A catalogue has been received from Th. Goldschmidt Corp. of New York describing the use of telindicator instruments in connection with canals and locks to show the condition of the locks from the main control room.

Welding and Cutting Equipment.—The Torchweld Equipment Company of Chicago has issued a new No. 28 catalogue which contains considerable data on gas welding equipment. Torches, outfits and accessories for gas welding are described.

Protective Coatings.—Apexior Number 3 is described in a bulletin issued by the Dampney Company of America, Boston, Mass. Its use as a protective coating for cold-wet or hot-dry metal surfaces is shown in its application to boiler fronts, flues, uptakes, coal conveyors, bunkers, tanks, piping, water screens, air washers, condenser parts, and ships' bottoms.

Direct Current Motors and Motor Generators.—Engberg's Electric and Mechanical Works, St. Joseph, Mich., has issued bulletins Nos. 6023 and 6025 covering constant and adjustable speed ball bearing direct current motors and motor generators. A complete description of this equipment is given in addition to dimensions, capacities and prices.

Welding Equipment.—The General Electric Company, Schenectady, N. Y., has issued a folder describing atomic hydrogen arc welding equipment. This new method of welding it is claimed has proved superior to metal or cabon arc welding due to the smoothness and ductility of the welds. A description of the process as well as that of the apparatus gives a comprehensive idea of the new development.

Cabinets.—A folder has been received from the Platter Cabinet Company of North Vernon, Ind., describing a complete line of cabinets and equipment suitable for stateroom or hospital furniture on passenger ships.

Port of New Orleans.—The thirty-first report of the Board of Commissioners of the Port of New Orleans, La., gives a description of the facilities of the port and a report of activities of the various departments of the board as of August 31, 1927.

Los Angeles Harbor.—The Board of Harbor Commissioners of the city of Los Angeles, Cal., has submitted its annual report for the fiscal year ending June 30, 1927. A description of the harbor and its development is given as well as a report of the facilities for loading cargo.

Ports of Norfolk, Portsmouth and Newport News, Va.—Port series No. 15 of the War Department Corps of Engineers, United States Army and United States Shipping Board, deals with the facilities of these three ports. Complete information is given in regard to conditions, customs and regulations, service and charges, fuel and supplies and communications.

Drum Controllers.—The General Electric Company, Schenectady, N. Y., has issued a bulletin illustrating the C R 3110 drum switches for series and compound wound motors used on crane hoists and for similar applications. The switches may be used on cranes having from 10 to 160 horsepower rating and have the advantages of compactness and smooth acceleration.

Marine Steam.—This is a new and revised edition of the well known book issued by the Babcock and Wilcox Company, New York. The work, which contains 281 pages, is replete with material of real value to the engineer. A history of the development of boilers and the theory of heat measurement, fuels and tests are dealt with in a thorough manner. The operation of marine boilers is explained, rounding out the subject of steam and its efficient generation.

Westinghouse Catalogue of Electrical Supplies. 1928-1930.—This catalogue presents the electrical and mechanical features and application information for all supply apparatus and appliances manufactured by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., and in addition describes and illustrates a representative list of large motor and generating apparatus. Effort has been made to give the electrical industry the most accurate and complete information and data concerning many products.

"Winton News".—The first issue of *Winton News*, a monthly bulletin published by the Winton Engine Company, Cleveland, Ohio, has been distributed. An outline of the history of the Winton Engine Company is contained in the bulletin. Reference is made to recent installations of the new Winton Model 130 engine in three new yachts, two of which are now under construction at the yard of Robert Jacob, City Island, N. Y., for Messrs. L. P. and W. A. Fisher. These yachts were designd by John H. Wells, naval architect, New York.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc... 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club. 4th and River Streets, Hoboken, N. J. President—Col. Bartlett.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association. 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty Street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Général—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

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